Vol. I DECEMBER, 1919 No. 9

THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry.

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EVERY new installation of a power plant in a paper mill—every addition to existing power equipment—is a special, individual problem.

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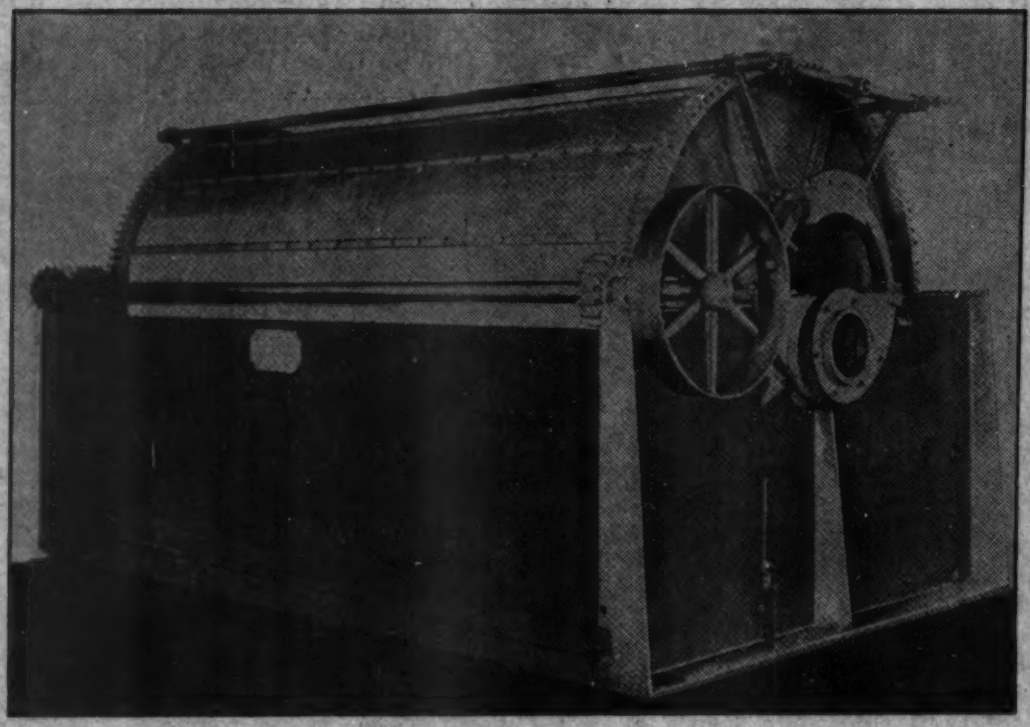

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Vol. 1—No. 9

THE PAPER INDUSTRY

PETER J. MASSEY
Editor

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of The Paper Industry

CONTENTS

FOR DECEMBER, 1919

		PAGE
Contents Page		692
Publisher's Page		699
Editorial Page		703
Pulp and Pulp Wood Deterioration	*D. C. Everest*	707
Humility	*Chas. E. Whelan*	712
Powdered Coal as a Fuel for Boilers	*E. R. Welles and W. H. Jacobi*	713
Electrical Equipment for Paper Mills	*W. W. Cronkhite*	718
The Handling of Paper Fillers	*E. G. Milham*	722
Effect of Soot on Boiler Efficiency	*Robert June*	725
The Paper Mill Cost System	*W. T. Schmitt*	728
Careful Belt Computations	*W. F. Schaphorst*	731
Power Plant for Board Mill	*B. M. Baxter*	732
Factors Affecting the Durability of Wood	*Kurt. C. Barth*	734
The V-Notch Liquid Meter	*L. G. Chase*	738
Coal and Ash Handling Equipment		740
Difficulties Encountered in Printing Papers	*P. J. Massey*	742
Power Plant Wastes	*F. F. Vater*	743
The Value of Waste Paper Stock in Paper Making	*Ed. T. A. Coughlin, B.S.Ch.E.*	744
The Application of Oil Fuel to Steam Boilers	*W. A. Darrah*	747
The Corliss Engine in Paper Mills	*G. H. Varley*	749
Care of Commutators and Brushes	*J. A. Randolph*	750
Proceedings of the Superintendents' Meeting in Chicago		751
Chips of Information		758-782
Commercial Outlook		783
Domestic Markets		785
Current Quotations		789
Import and Export Markets		793
Buyers' Guide		797-799
Alphabetical List of Our Advertisers		801

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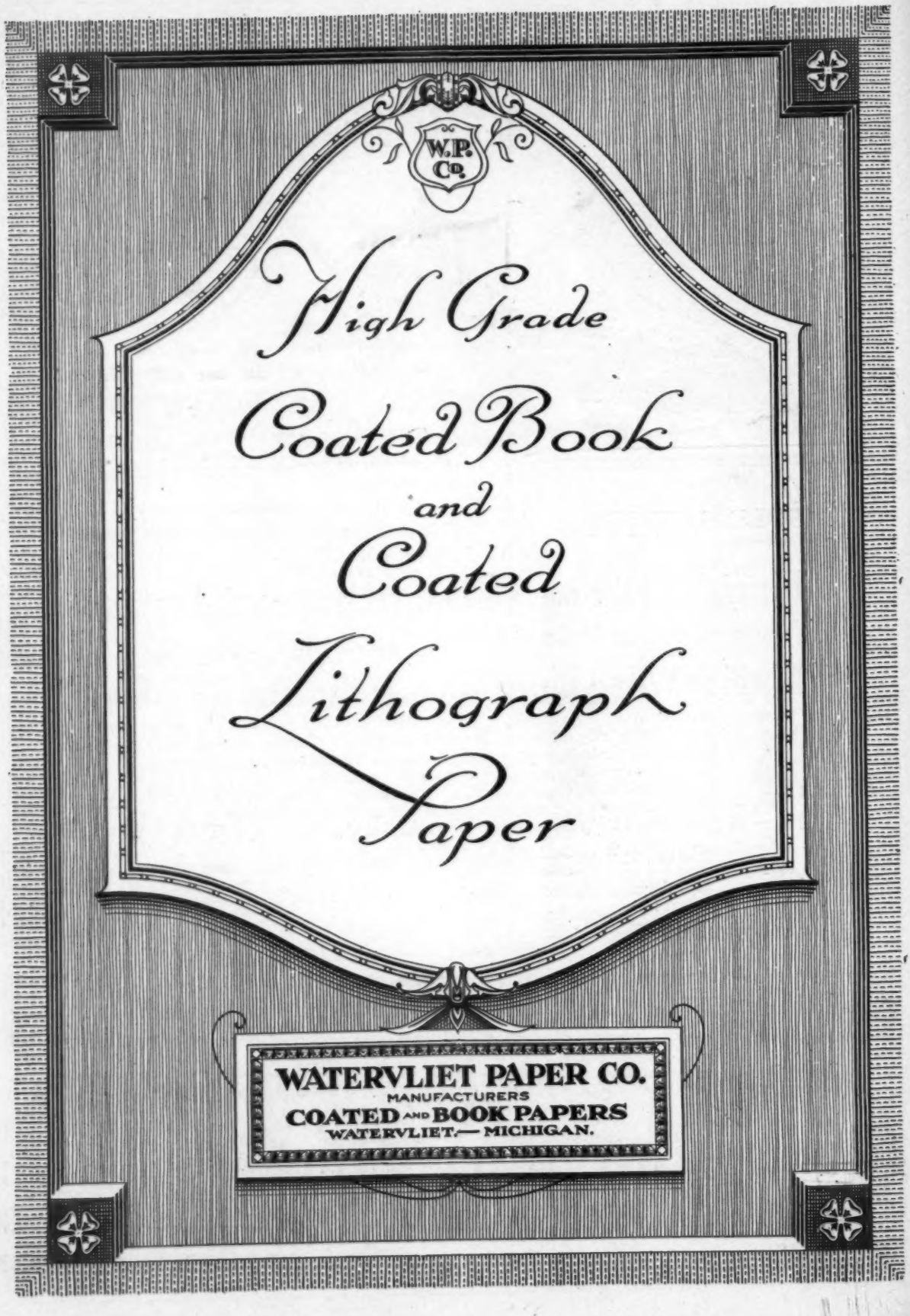
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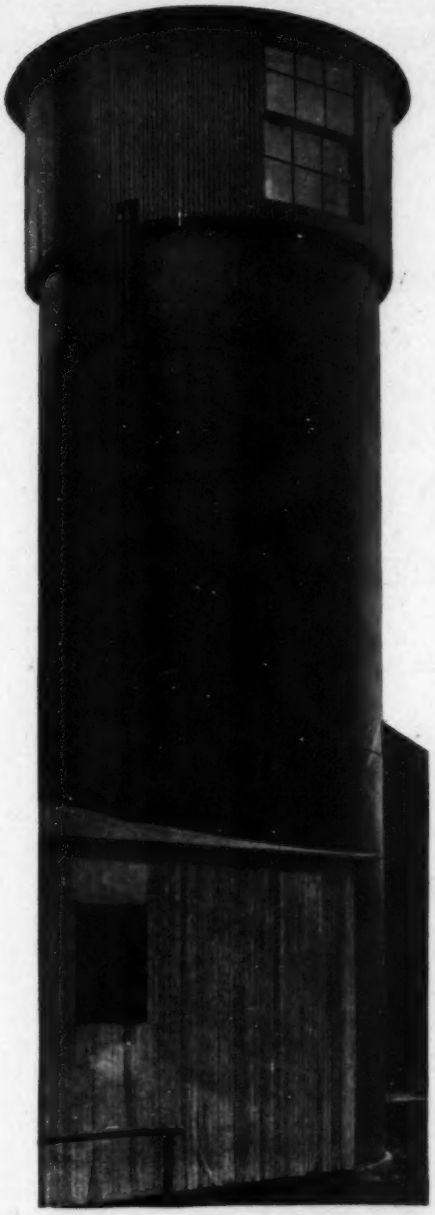

Coal Waste in Paper Mills

FOR some months we have been stressing the advantages of using softened water in the process of paper manufacture. This month we want to lay special emphasis on the tremendous fuel saving that can be accomplished by the use of a Bartlett-Graver or a Graver type "K" water softener and purifier.

It does not require very long to deposit scale in a boiler tube, particularly if hardening ingredients are present in the water in large quantities. Scale 1/16" thick in your boiler tubes means that of every 10 pounds of coal you burn, one pound is wasted because the scale acts as an insulator between the heat outside and the water inside the tube. As the scale grows thicker, the loss is proportionately greater.

Other paper mills have eliminated this tremendous waste by installing Graver water softeners. It will cost nothing to learn what can be accomplished in your mills. Write us.

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Protection to the nation in time of war in that it furnishes the plants, the technique and the intermediate products for the manufacture of high explosives and poisonous gases.

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Protection to the textile, leather, paper, printing ink, paint and other dyestuff consuming industries producing over two and a half billion dollars of manufactured goods a year, employing over one million people and representing upwards of two and one-half billion dollars in invested capital.

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In developing and safeguarding, with every means at our disposal, a self-contained American dyestuff industry, American manufacturers are therefore laying and preserving the very keystone of our national and industrial independence.

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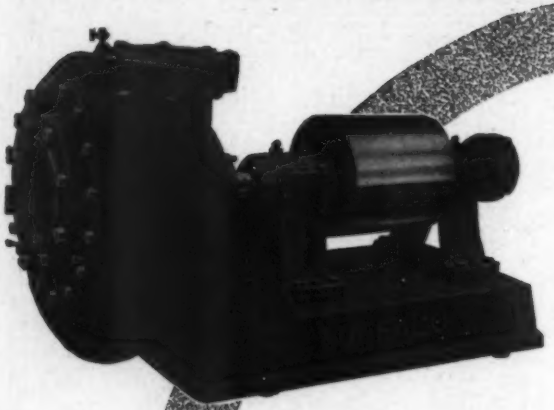
A Closed Hand Cannot Receive Anything

FROM the time when we were small children we were told the story of the miser, how he hoarded his gold; how he refused to allow a cent to go out, and how he took in all he could get and gave out nothing.

During the war most people delighted in giving, with no thought of something in return; and yet all received more than we gave out, not in dollars, to be sure, but in real satisfaction in knowing we had done a good service. The Paper Industry was started and has been run with the single purpose of doing a real service for the paper industry, and not simply to make money. We have, and intend to continue, to give out more than we take in. Our hands are wide open, for the publisher has long ago learned that the more we give the more we will get; that when we have our hands open, ready to give out, these same hands can also take in anything that is good. In a talk at the superintendents' meeting at Hamilton, Ohio, recently, Mr. George Harvey stated that he thought it was a fine thing for these men to come together, providing every man was ready to give out as well as take in. We regret that there are a few paper manufacturers that still feel that they can keep their hands closed and yet take in everything that they wish, or in other words, keep all they have and take all they can get, and yet give out nothing; but this cannot be done.

One of the greatest drawbacks to the best progress of this industry has been this keeping aloof from one another, particularly in the manufacturing end of the business, and the paper industry will never take its proper place at the head of the list of great industries of America until all of them are willing to give, as well as take. No one firm has all the brains in the industry, and so let us be willing to open up our hands, for remember that A Closed Hand Cannot Receive Anything.

EDWARD B. FRITZ.



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Designed and Built to Eliminate Clogging

Buffalo Paper Makers' Pumps are designed to meet the requirements of the paper manufacturer—for handling ground wood stock.

They are in successful use in the largest paper mills in the country for handling ground wood pulp.

Handles wood stock up to 4%

¶ Built for heavy duty continuous service—non-clogging—special designed impeller with extra wide openings.

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Buffalo Steam Pump Co.
Buffalo, New York

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Sta-White is manufactured under proven formula—the result of years of study, experience and tests.

Sta-White will not turn yellow in service—its value has been demonstrated in thousands of manufacturing plants in all parts of the country.

Sta-White points the way to maximum mill white service. It combines all the features which make a mill white effective and can be used without the hazard of experiment. For maximum service and low ultimate cost it will pay you to use Sta-White. Economically applied by air or brush.

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BOOK PAPERS

EGGSHELL, MACHINE, ENGLISH, SUPERCALENDERED, and ENAMEL GRADES

Monarch Paper Co.
Kalamazoo Mich.

EDITORIAL

NOW that the strikes called by Labor Misleaders—who believe that industrial agreements, like treaties, are but scraps of paper—have been settled through the power of public opinion, let us turn the calcium onto the patrioteering profiteers.

The time is close at hand for a new deal all around, and both capital and labor will soon find that there is another factor to be reckoned with. The days of sham battles and passing the buck are drawing to a close with the awakening of the third factor in business, who has received all the blows and paid all the bills.

Let no profiteer, whether he be manufacturer, jobber, retailer, red or labor leader believe that the public is going to permit the merry-go-round to go on much longer, for the day of retribution is at hand and can no longer be evaded.

The same power that set back the red is not going to swallow the patrioteering profiteer. Your business may not be an offender, but every business is under suspicion and must prove itself innocent before the court of public opinion.

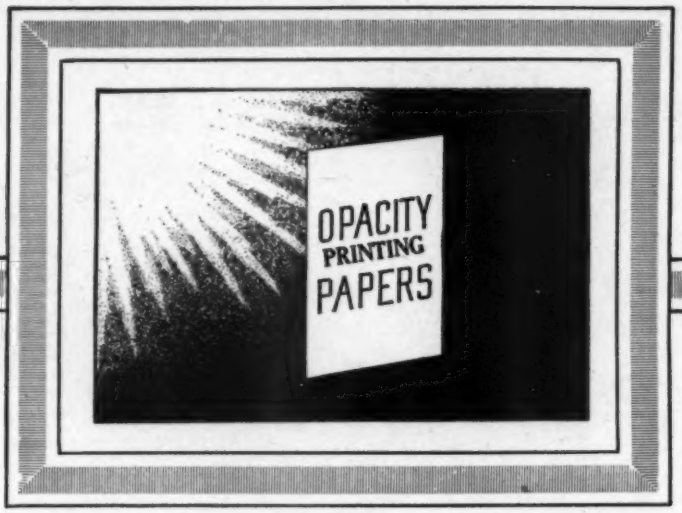
Now is the time for you to prepare your case by adopting clean, progressive business methods, insisting upon full value when buying, whether it be raw materials, labor or both. But don't forget to revise your own profits downward to the safety point of reasonable returns for the capital invested. Don't pass the buck that the other fellow is overcharging you; the merry-go-round must stop somewhere and it might as well stop with you, by refusing to pay the excess profit to the profiteers who are gouging you.

Let us all remember that the war is over, and that many things that might have been condoned, or even looked upon as virtues during the war period, are now viewed very differently. Go after the problem, "with malice toward none and charity for all, with firmness in the right as God gives us to see the right," and be sure to have sufficient "firmness" to carry the good work on.

If you don't. If you still continue to go on blind to the fact that the war is over, you're going to get a very unpleasant surprise. The power that smashed the Reds in Seattle, the policemen's strike in Boston, and the steel and coal strikes all over the country, is not going to let you pick its pockets much longer. It's going to smash YOU next.

A great responsibility is resting on your shoulders if you measure up to it. The American Public, which has conducted Tea parties and other functions on previous occasions of this kind, will give you what's coming to you if you don't measure up to it; you are going to get—

What's coming to you.



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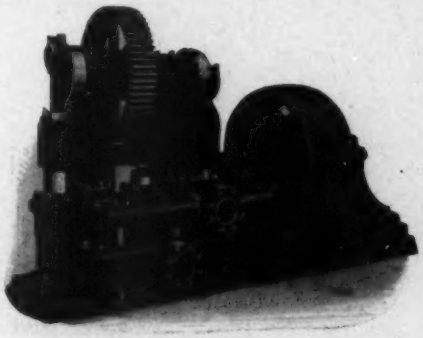
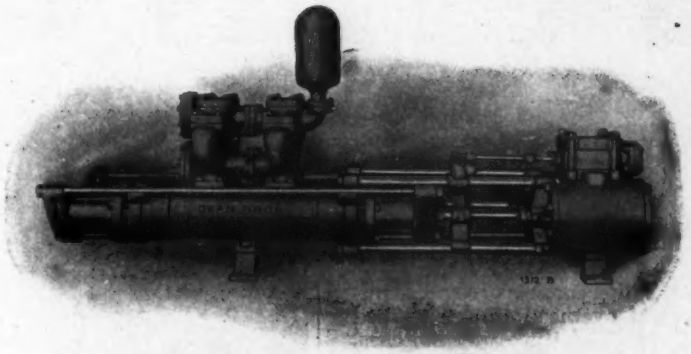


Vertical Triplex Electric Pump

PUMPS FOR ALL PURPOSES



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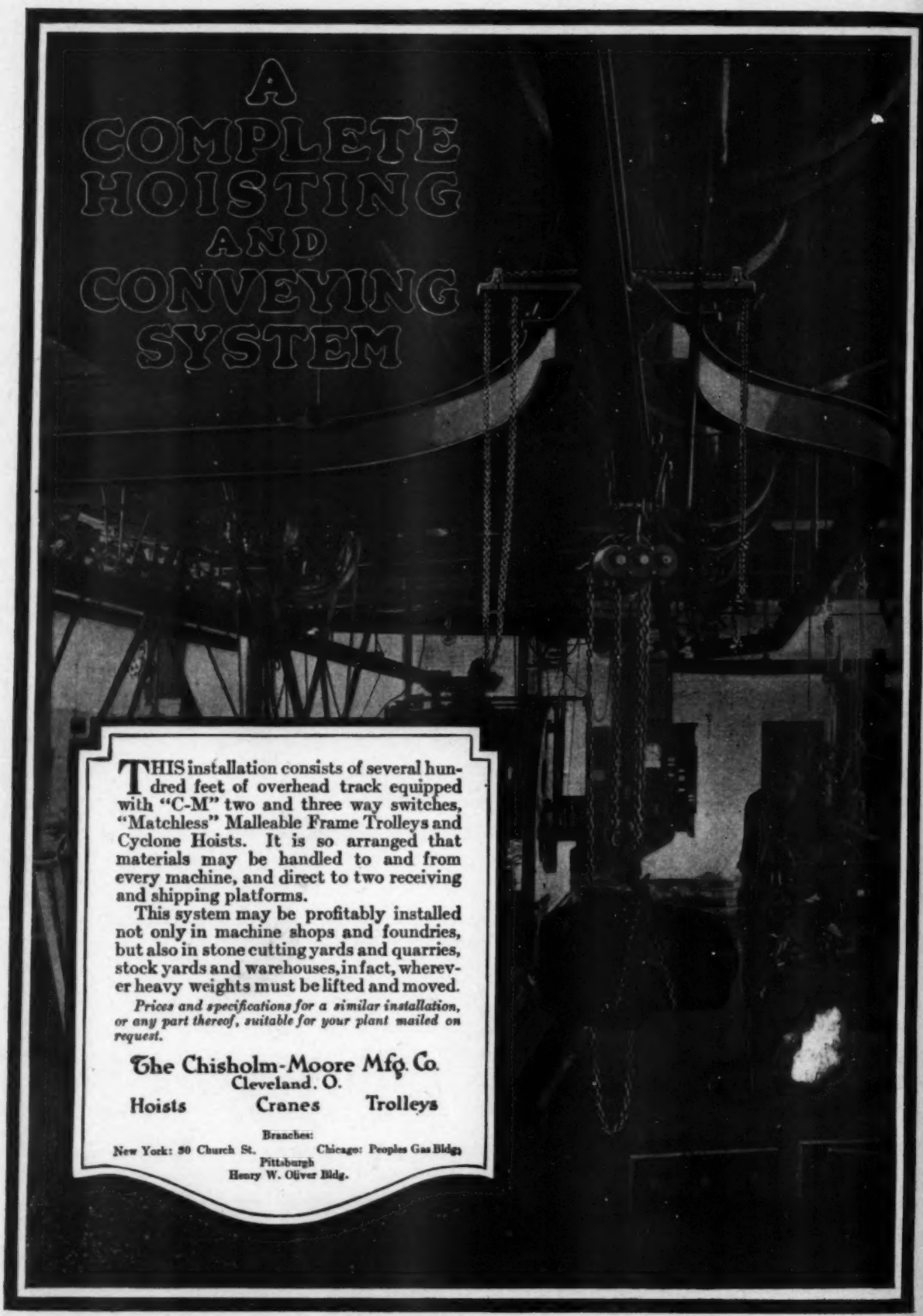

THIS installation consists of several hundred feet of overhead track equipped with "C-M" two and three way switches, "Matchless" Malleable Frame Trolleys and Cyclone Hoists. It is so arranged that materials may be handled to and from every machine, and direct to two receiving and shipping platforms.

This system may be profitably installed not only in machine shops and foundries, but also in stone cutting yards and quarries, stock yards and warehouses, in fact, wherever heavy weights must be lifted and moved.

Prices and specifications for a similar installation, or any part thereof, suitable for your plant mailed on request.

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To Pulp and Paper Manufacturers!

Groundwood, Sulphite and Pulpwood Deterioration Investigation

You are undoubtedly familiar with the efforts which have been made for securing an appropriation for the Forest Products Laboratory at Madison, Wis., which would permit of their making an exhaustive study of the problems of deterioration in Groundwood, and Sulphite Pulp and Pulpwoods of various characters, and that up to the present time no such appropriation has been secured and that it does not look as though one could be secured during the present session of Congress. It, therefore, appears to me that if manufacturers generally are sufficiently interested in this proposition which is of such vital importance to us, the only way to get results is to contribute to a fund which will finance such investigation for the period of one year at least.

We have all contributed to funds of various characters during the past few years and from which we derived but indirect benefit. But here is a proposition which, if solved, will prove of immense benefit to us and to the paper industry at large. The Forest products Laboratory at Madison, Wis., is undoubtedly the best equipped institution in existence today for the study of this important subject and much work has already been done, but without funds for this specific work we cannot hope for definite results and we must assume the financial burden which, if distributed among a few manufacturers, will not amount to anything for any one of us and for the value of a few tons of pulp we may receive benefits which cannot even be estimated in dollars and cents.

Certainly no problem is more interesting than that which conserves pulpwood, and particularly if labor has been expended on such wood or even more, if it has been c[illegible]rted into pulp. We have all suffered losses eithe[illegible]he complete or partial destruction of stored pulp an[illegible]pulpwood through fungous or other growth and have [illegible]hrown away or burned up tons of material which we considered "rotten." It has been demonstrated to a very certain degree that this problem can be solved and a remedy found for the disease which gives us so much trouble and I firmly believe we should chance the small contribution it will require to give the laboratory an opportunity to work out a solution, if possible.

It is estimated that $15,000 will be ample to carry on this study for a year at least, securing the services of the best pathologists and other experts required for the work. The results of this investigation by the laboratory must be published for general distribution the same as the results of any other laboratory investigation would be published. Am enclosing copy of report on work done to date.

This thing appeals to me so strongly that I have decided to take this matter up with about thirty of the concerns which I think are vitally interested in this problem and ask them to agree to contribute a maximum of $500 each to this fund when called upon to do so, and I would appreciate hearing from you as to whether you will assist in the work to that extent. This company will contribute such an amount and it would be my idea to turn this money over to Carlisle P. Winslow, Director of the Forest Products Laboratory, for this work and he to render an account to the contributors of the money expended at the end of some stated period. Should the work be discontinued for any reason the unexpended balance to be divided pro rata among the contributors according to their original contributions.

The following concerns have agreed to contribute toward the investigation of deterioration in groundwood, etc.:

Thilmany Pulp & Paper Co., Kaukauna, Wis.
Wausau Paper Mills Co., Brokaw, Wis.
Dells Pulp & Paper Co., Eau Claire, Wis.
Consolidated Water Power & Paper Co., Grand Rapids, Wis.
Nekoosa-Edwards Paper Co., Port Edwards, Wis.
Northern Paper Mills Co., Green Bay, Wis.
Northwest Paper Co., Cloquet, Minn.
Kimberly Clark Co., Neenah, Wis.
Rhinelander Paper Co., Rhinelander, Wis.
Flambeau Paper Co., Park Falls, Wis.
Wisconsin River Pulp & Paper Co., Neenah, Wis.
Marathon Paper Mills Co., Rothschild, Wis.

We have all contributed liberally to things for others and I trust you will agree with me that we can now well afford to contribute to something for our own benefit. May I have your comments and decision in this matter promptly.

Yours very truly,
D. C. Everest,
Secretary and General Manager,
Marathon Paper Mills Company.

Mechanical Rubber Goods

for Paper Mills

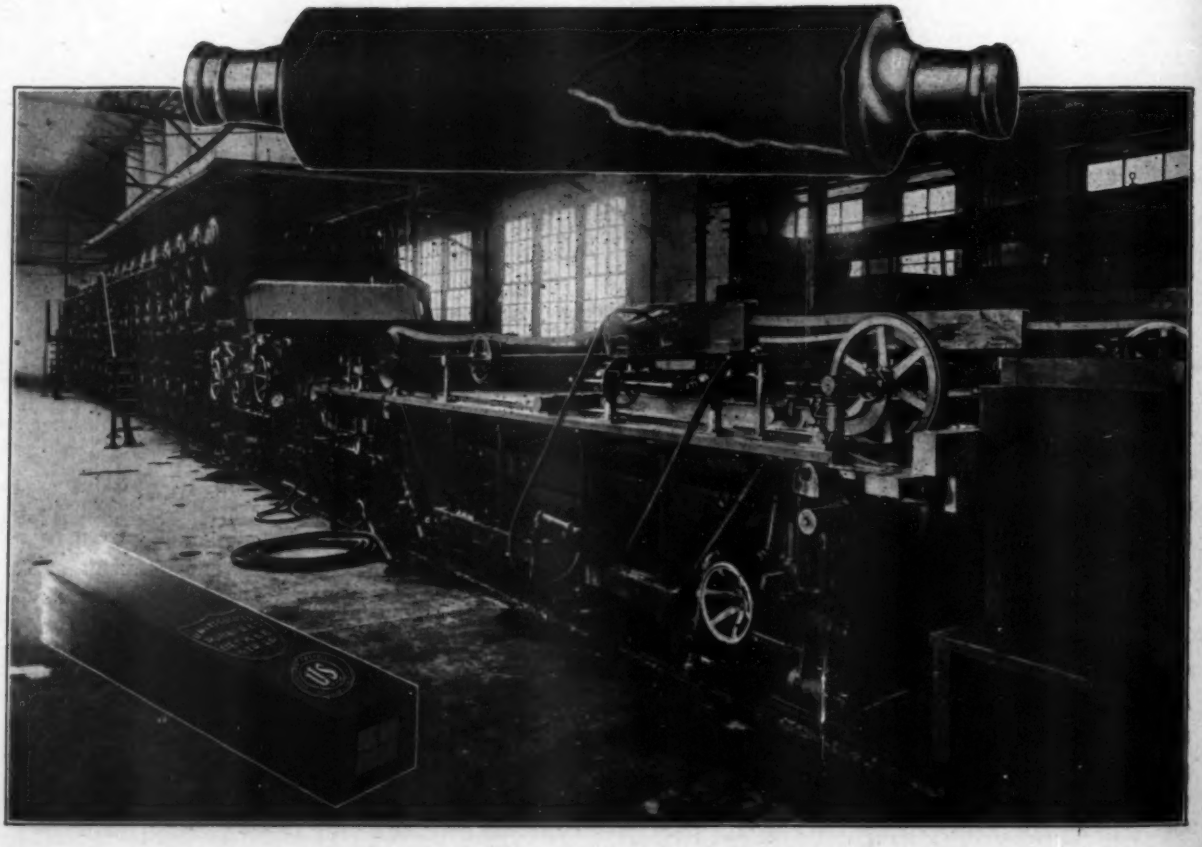
YEARS of experience in manufacturing rubber goods for paper and pulp mills enable us to supply the right product for every requirement.

¶ Our method of covering rolls insures a uniform surface, exact crowning and correct density for the specific work required.

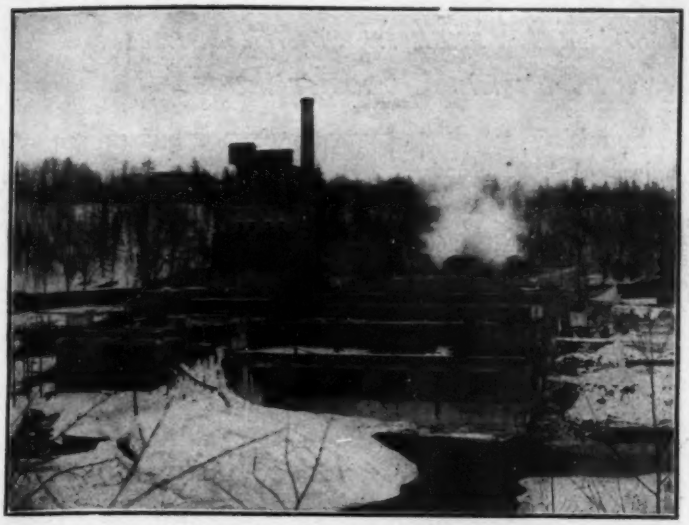
¶ In our deckle straps the patented insertion assures uniform displacement and obviates any tendency toward distortion.

¶ Among our other products for paper mills are transmission belting, chip conveyor belts, machine hose, steam hose, water hose, fire hose, screen diaphragms, packings, suction box gaskets and connections.

United States Rubber Company



35 Big Paper Mills Are SAVING COAL and Increasing Production

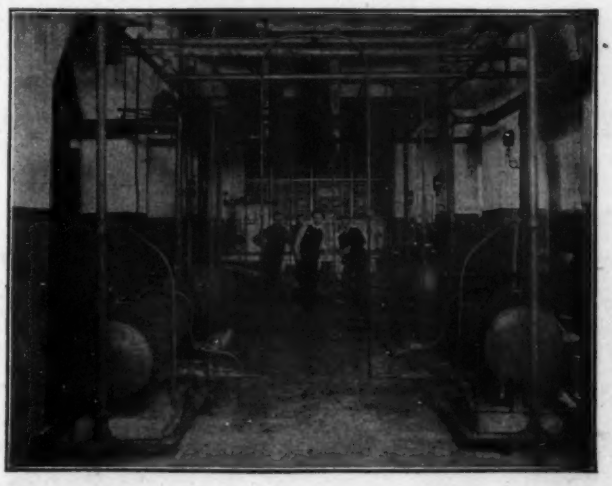


FARNSWORTH

machines solved the problem at the Donnacona Paper Co., in Canada, just as our closed system has solved condensation problems at 35 big paper mills here and abroad. Here you see the big mill where our machines are in action. The center picture shows four of the ten large machines draining and pumping condensation from paper machines, heating system, etc. Specify FARNSWORTH to get full value from your coal, and to increase your production.

Why Farnsworth Machines Excel in Service

1. Because they conserve the heat units in the condensation.
2. Provide better heating or drying by clearing the water out of the heating system or heated aparatus.
3. Pull a vacuum on sluggish return lines, clear the water and provide a free circulation of steam.
4. In addition to pulling a vaccum, the condensation is held under pressure and pumped under pressure directly into the boiler at a high temperature.
5. Eliminate piston or centrifugal type boiler feed pumps, feed water heaters, vacuum pumps, receiving tanks, floor space for the above mentioned, considerable piping, pipe covering, lubricating oils, packing, etc.
6. Feed water into boilers much hotter than pumps can or will handle it.
7. Prevent loss of heat units going up the vent pipe from receiving tanks.



Why Farnsworth Machines Excel in Service

8. Prevent loss of heat units going down the sewer from the overflow pipe of the average low pressure open feed water heater.
9. Use 75 to 90% less steam than a piston or centrifugal type pump.
10. Feed condensation from high pressure traps, coils or heated apparatus directly into the boiler at a temperature over 300 degrees.
11. Create better circulation through heating system or heated apparatus so that less back pressure can be carried on the exhaust line of the engine.
12. Provide closed system and drains condensate under pressure so that no heat units are lost by reducing pressure before the water enters the boiler.
13. Drain vacuum systems, eliminates the vacuum pump and the necessity of operating high pressure boilers on vacuum systems.
14. Pull a higher vacuum on heating systems than any vacuum pump.
15. Use 90% less steam than vacuum pumps.

More than 500 plants saving $1,500,000 a year in coal because they are "Farnsworth equipped."

Place the Farnsworth Duplex Boiler Feeder above your boilers. Discharge all your high pressure traps directly into it. Any low pressure condensation you have in scattered buildings draw to a Farnsworth Condensation Pump, which will deliver it to the Farnsworth Duplex Boiler Feeder. This method forms a closed system that keeps the condensate under pressure and feeds it directly into the boilers at higher temperature, thus conserving heat units and saving coal.

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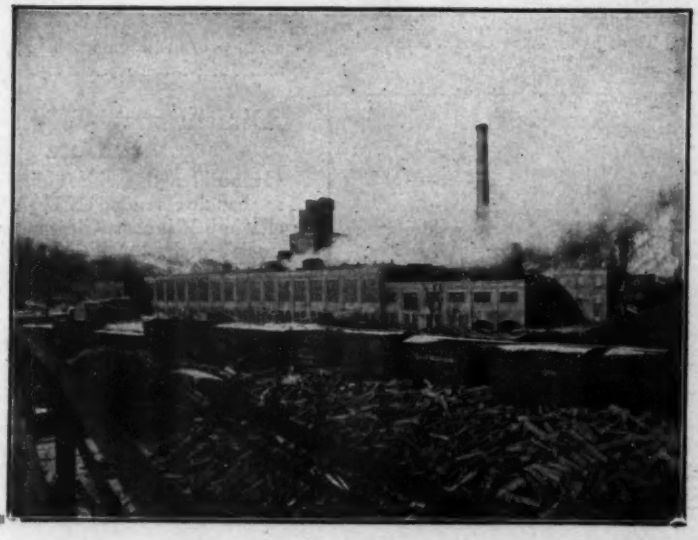
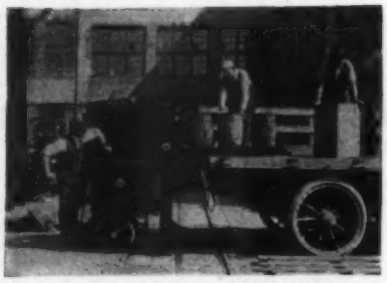


Here's the Problem to Solve

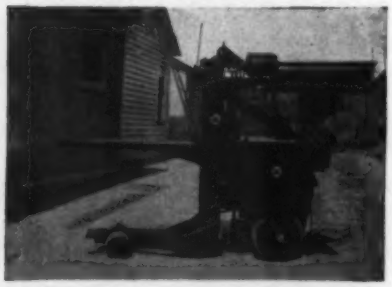
How can You Use the Tier-Lift Truck in your Business?
Read Contest Conditions on the Opposite Page.

Straight Trucking



Lifting for Delivery

Tiering with Experimental Racks
(Heavy-Compact)



Tier-Lift Truck Lifting Platform
Partly Elevated

Trucking

Carries a load of 4,000 pounds which it hauls and lifts.

Travels without load three to six and one-half miles per hour (260 to 570 feet per minute.)

Travels with 4,000 pound load at two and one-half to five miles per hour. (220 to 440 feet per minute.)

Lifting

Lifts and carries loads up to 4,000 pounds from 11 inches to 76 inches from the floor or to intermediate heights.

Lifts 4,000 pounds at the rate of one inch in 1.5 seconds, or one foot in 18 seconds. Lifts five inches, (average clearance height,) in 7.5 seconds.

Loaded or unloaded, platform lowers at the rate of approximately 2 inches per second.

Tiering

Tiers mechanically in conjunction with racks designed to meet factory conditions. Tier-Lift truck platform dimensions are 54 inches in length, 26 inches in width, 3½ inches in thickness beyond the supports and 8 inches at the braced end.

The use of trays permits wide variation in design of racks.

Three Tiering Heights

The Tier-Lift Truck is made in three standard tiering heights of platform: 42, 60 and 76 in. This gives overall heights of 61½, 79½ and 96¼ in., respectively.

Dimensions, Weight and other Data

Over-all length (with folding steering handle extended) 121½". Over-all width 36 inches. Clearance under truck 3 inches. Weight (including batteries for 8 to 10 hour continuous operation) 3030 pounds. Minimum turning radius (extreme outside corner) 92 inches. All operations mechanical, electrically controlled by one operator.

Trucking with Trays

Lifting for Storage

Tiering with Experimental Racks
(Light-Bulky)

Travels Backward and Forward

One notice only will be made in each of the publications used to announce this competition

Get Busy Today, The Competition Closes January 30, 1920

$1,000 for an Analysis

A Committee appointed by the Society of Industrial Engineers will make three awards: $1,000, $500, $250. Competition closes January 30th, 1920

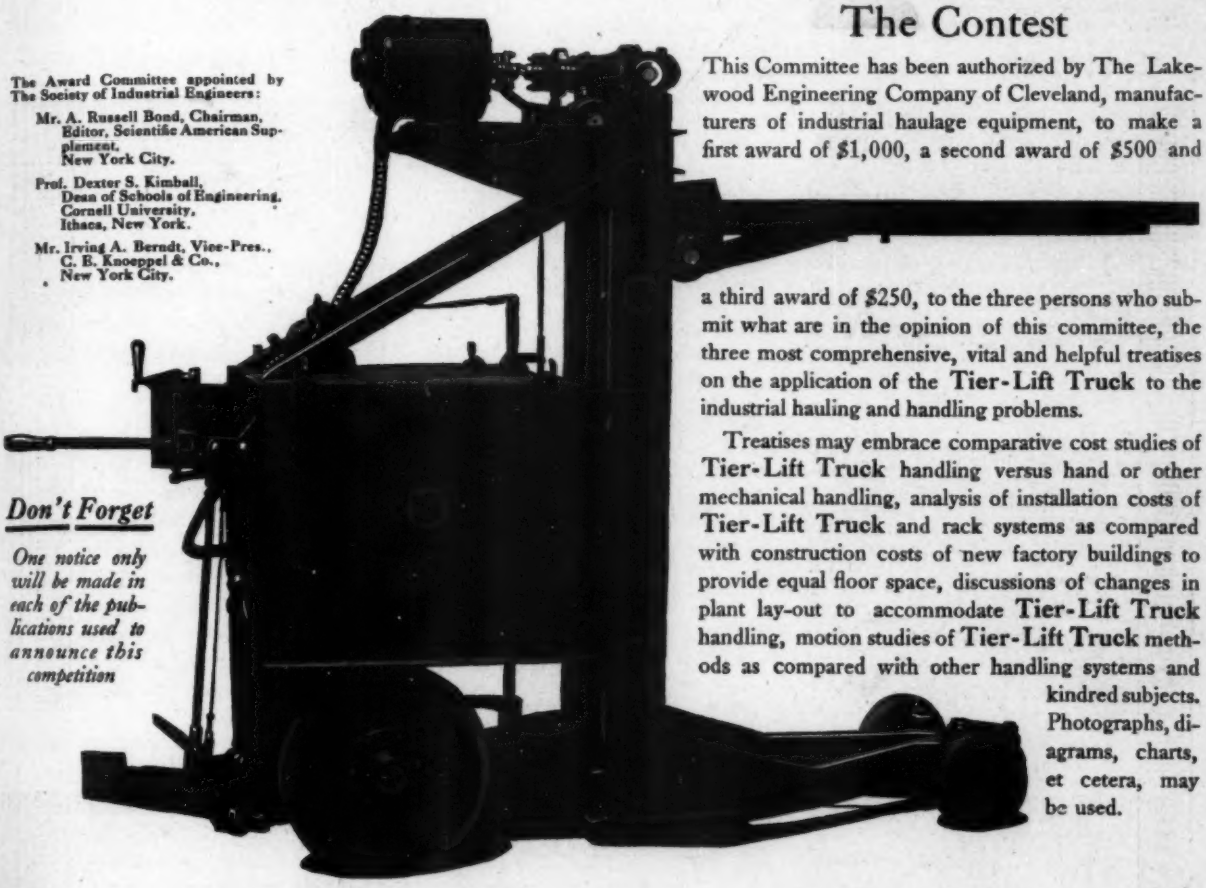
TO get increased production in the face of the present man-power shortage is uppermost in the minds of business executives. Employer or employee, you ought to *Analyse Your Own Production and Labor Problems*. If this contest induces only managers, engineers, and others to study *Industrial Haulage Methods, it will have done something worth while.*

The Award Committee appointed by The Society of Industrial Engineers:

Mr. A. Russell Bond, Chairman, Editor, Scientific American Supplement, New York City.

Prof. Dexter S. Kimball, Dean of Schools of Engineering, Cornell University, Ithaca, New York.

Mr. Irving A. Berndt, Vice-Pres., C. E. Knoeppel & Co., New York City.



Don't Forget

One notice only will be made in each of the publications used to announce this competition

The Contest

This Committee has been authorized by The Lakewood Engineering Company of Cleveland, manufacturers of industrial haulage equipment, to make a first award of $1,000, a second award of $500 and a third award of $250, to the three persons who submit what are in the opinion of this committee, the three most comprehensive, vital and helpful treatises on the application of the **Tier-Lift Truck** to the industrial hauling and handling problems.

Treatises may embrace comparative cost studies of **Tier-Lift Truck** handling versus hand or other mechanical handling, analysis of installation costs of **Tier-Lift Truck** and rack systems as compared with construction costs of new factory buildings to provide equal floor space, discussions of changes in plant lay-out to accommodate **Tier-Lift Truck** handling, motion studies of **Tier-Lift Truck** methods as compared with other handling systems and kindred subjects. Photographs, diagrams, charts, et cetera, may be used.

Conditions Governing the Competition

THE competition is open to anyone except employees of The Lakewood Engineering Company. That company reserves the right to use any manuscript submitted. Only one award will be made to a contestant. Each contestant may submit as many articles as he desires.

Contestants are requested not to seek from The Lakewood Engineering Company or elsewhere, other information pertaining to the **Tier-Lift Truck** than that shown on the opposite page. Only data based on the information presented will be given consideration.

Send your manuscript to Mr. A. Russell Bond, Chairman, Award Committee, Editor, Scientific American Supplement, New York City.

Write the title of your treatise on the first page of your manuscript. Do not write your name on the manuscript. On a card in a separate sealed envelope send your name, the title of your treatise, (the same title as that appearing on the manuscript), your business connection, and your address.

The contest closes January 30th, 1920. Manuscripts received after that date will not be permitted in the competition. Awards will be made prior to February 28, 1920.

Humility

Why seek ye the limelight? Its white, steady glare
May make you the center of curious stare;
May bring to your ears the praise trumpet's blare;
And people your plaudits may sing.
Is this the sum total of all earthly joy?
I think 'tis a bubble, a bauble, a toy!
I'd rather be friend of the raggedest boy
Than sit on a throne as a king.

The world has its men who are buying the earth;
Its rulers of millions by mere right of birth;
Creators of sadness and makers of mirth;
All these does this destiny bring.
But I'd rather do what little I may
To give my next neighbor a happier day;
I'd rather go with him and show him the way
Than sit on the throne as a king.

It may be that you are a hoarder of gold;
You think that your money shall straightway unfold
The pathway to greatness. You hate to be told
That wealth is a perilous thing.
I'd rather eat bread honest labor has earned,
With the man the aristocrat proudly has spurned,
And know that his face to the right goal is turned
Than sit on a throne as a king.

Take the limelight away! In every man's eyes
I want him to know that I'm just of his size—
Like hopes, like sorrows—that I want him to rise,
Ambition within him to spring.
And then, side by side, we'll go down the road;
And I'll let him reap in the field that I sowed.
I'd rather be pulling my share of the load
Than sit on the throne as a king.

Chas. E. Whelan.

THE PAPER INDUSTRY

"The Educational Magazine for the Paper Industry"

Vol. I December No. 9

Powdered Coal as a Fuel for Boilers

EDWARD R. WELLES* and W. H. JACOBI†

Part I—General

BEFORE entering into details concerning this form of combustible, it is not out of place to emphasize that in the process of burning fuels, certain very definite operations take place which depend strictly on the physical and chemical properties of the fuels. The reactions that take place, the quantity, quality, density and temperature of the gases that result during combustion and their effects, as well as the practical rate of burning to secure perfect or nearly perfect combustion, have all been defined, clearly enough for practical application; but unfortunately because of the cheapness of all fuels the importance of those properties have not received the attention they deserve. We are more interested in the calorific value of fuels per unit weight regardless of whether they are of the solid, liquid, or gaseous order; that is, we look at a pound of fuel as the container or so many b. t. u.'s and on that basis are prone to use one form of fuel or another in any service expecting equal results. Our conception of the thermal form of energy is still that of an imponderable fluid instead of, correctly stated, a condition of matter. The common conception is that radiation does more heating than convection and conduction whereas in reality the opposite is the case. We speak freely of heat transfer from one body to another instead of its propagation, almost without regard to the relative value of specific temperatures, conduction, convection and radiation. We overlook the fact that the available heating capacity of a fuel is the surplus left from that developed in its conversion to the ultimate gaseous oxides, and that we can use only a portion thereof depending not on the temperature that develops during combustion, but on the nature of the work to be done and the temperature at which that work can best be done. The energy consumed by combustible materials in the transition from the gaseous, the liquid and solid forms into the ultimate gases is different for the same quantity of burnable constituents. Each case involves a different time element, being shorter with gases, longer with liquids and longest with solids. The presence of elements other than carbon and hydrogen, and their more or less complex formation, increase the endothermal losses, and affect directly the temperatures that develop. In consequence, not only the heating value of each kind and form of fuel is different from that expected from preliminary analysis but the effects of the resulting properties are different. In burning lump coal on account of the slow rate of combustion, sufficient time is allowed to equalize its variable structure and impurities. Liquid and gas fuels, on account of their uniform structure give constant deflagration regardless of the rate of burning, and the effects of the actions that take place in burning are of less consequence.

With powdered coal, on account of the rapid combustion, the effects due to the structure and amount and nature of the impurities are conspicuously manifested by the varying high temperatures and the unsteadiness of deflagration. The necessity of carefully considering the actions that take place in the combustion of powdered coal to adequately provide for their efficient utilization is thus made apparent. When

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†Mechanical Division, The J. G. White Engineering Corporation.

dealing with the combustion of fuels and heating, we are confronted with problems concerning the molecular structure of materials in all their possible forms, and as such, we should treat the matter on a different basis than mere b. t. u. considerations.

The enthusiasm for, failure with, and prejudice against powdered coal are due to the absence of sufficient understanding and experience in regard to the structure and behavior of materials (mechanics of

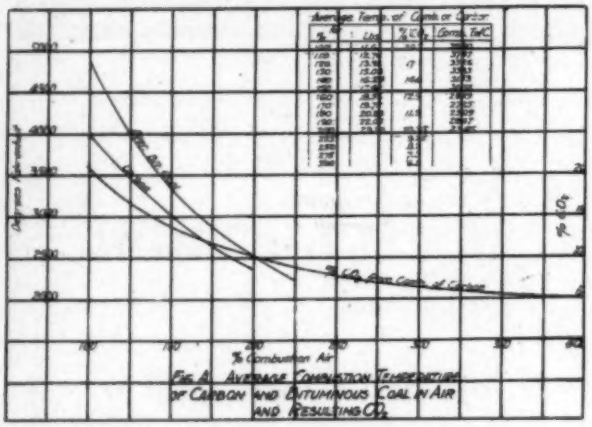


FIG. A. AVERAGE COMBUSTION TEMPERATURE OF CARBON AND BITUMINOUS COAL IN AIR AND RESULTING CO_2

chemical reactions)—and to realize its impending success, theoretical considerations and practical results must unite to adjust and overcome the apparent discrepancies and inconsistencies so far encountered.

The knowledge gained in the combustion of powdered coal in contrast with that of liquid and gaseous fuels, permits us at this time to designate its merits as well as its limitations as a fuel. At the outset, experience gives warning against growing too enthusiastic over its universal possibilities, though by no means restricts the wider and more efficient use of coal as a fuel.

The merits of powdered coal, briefly stated are:

(a) If ground fine enough, the entire combustible content of coal can be burned, thereby effecting fuel economies hitherto not attained even with the better grades of coals burned under favorable conditions.

(b) It permits the use of all grades of coal, including peat and lignite, with approximately equal degree of thermal efficiency for the same service, and increases very materially the energy that can be derived from the world's supply of coal.

(c) It possesses very largely the facility of control and combustibility of oil and gas fuels, thereby placing coal on a parity with those fuels.

The limitations of powdered coal, briefly stated are:

(a) The very high temperatures attending its efficient combustion (see Fig. A) and the unsteady mode of its deflagration, necessitating special furnace construction to secure reliable service and realize the possible economies it affords, preclude its ready application to existing equipment.

(b) The operating cost and attention required to maintain the necessary apparatus for its use, may more than offset the fuel economies that can be effected in small independent services.

(c) The presence of ash which may not always be collected and held under control.

(d) The human element which will not submit to the peculiarities of its nature.

For their flexibility and nicety of operation, gaseous fuels rank first and are followed by liquid fuels (oils) powdered coal and lastly solid (lump) fuels. On the basis of cost they assume exactly the reverse order. The economy depends on the nature of the service and local conditions.

The valuable feature of powdered coal is that by reason of its divided state it can be brought en masse into more intimate contact with the necessary air for its combustion, and in consequence, when injected in a suitably heated hearth, it burns completely, deflagrating almost as readily as atomized oil.

Obviously the first requisite is to render the fuel into as fine particles as is possible, so that when mixed with air the mixture shall assume the form of a homogeneous gas. This analogy is comparative only, for no matter how finely broken and thoroughly mixed with air the coal particles are, they retain their solid structure and are therefore subject to a very arduous process of combustion, which is responsible for the attendant high temperatures that result.

The standard established in cement mill practice, generally adopted for all purposes, is that 85 per cent of the powder shall pass through a 200-mesh screen, and 95 per cent through a 100-mesh screen. Coal so ground weighs from 35 to 45 lbs. per cubic foot, and one pound of it can be carried in suspension through smooth piping in about 5 pounds of air moving at

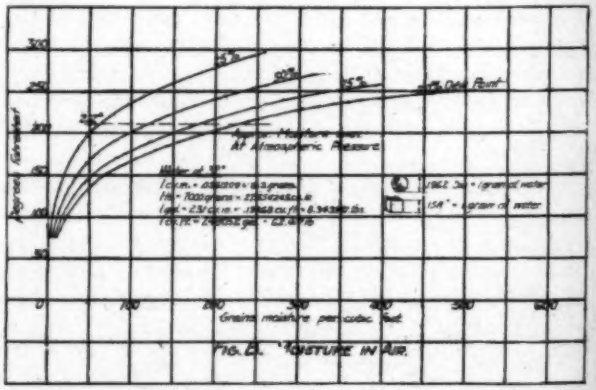


FIG. B. MOISTURE IN AIR.

low velocities. Experience shows that under favorable conditions 100 per cent 60-mesh powder can be burned satisfactorily. This coarse fuel necessarily entails longer time to be consumed and can only be carried in suspension at high velocities and its use would only be permissible in furnaces which provide a long path for the resulting flame. In short chambers operating at low velocities these large particles

fall to the bottom of the chamber before being consumed and coke, thereby incurring a loss of fuel.

Granulated coal ranging in size from ¼ inch to powder has been used as fuel in boilers aboard ship, it being blown into specially constructed hearths. This method has given good results in forcing generation of steam; but it is not strictly in the class of burning powdered coal in suspension, and does not possess the same range of possibilities.

Coarse powder has the redeeming quality of dampening the temperature of the furnace and may be resorted to to cool overheated hearths without chilling; nevertheless, powder larger than 80-mesh grade should be avoided in ordinary operation for best results. A uniform mixture averaging 100 per cent 150-mesh or finer should be obtained, especially in the case of low grade coals.

Pulverizing mills of regular manufacture are made to produce powder of the cement mill standard, and on the basis of fairly dry coal, the average cost of pulverizing runs from 15 to 30 cents per ton ground at the rate of 2½ to ¼ tons per hour respectively.

In burning powdered coal there is no restriction on the variations in quality found in commercial grades. Low grade coals perform better than high grade on account of the large proportion of impurities which result in less destructive temperatures and thereby in lower combustion losses. Generally it is necessary to dilute with air the gases resulting from the combustion before they are used. Less dilution is required with low grade coals and in consequence more economical operation is obtained through their use.

A large proportion of volatile matter has heretofore been regarded as a leading requirement for powdered fuel on account of combustibility, but experience does not support this, on the other hand, it is considered expedient and beneficial by some to drive off a portion of the gaseous contents of coal before burning.

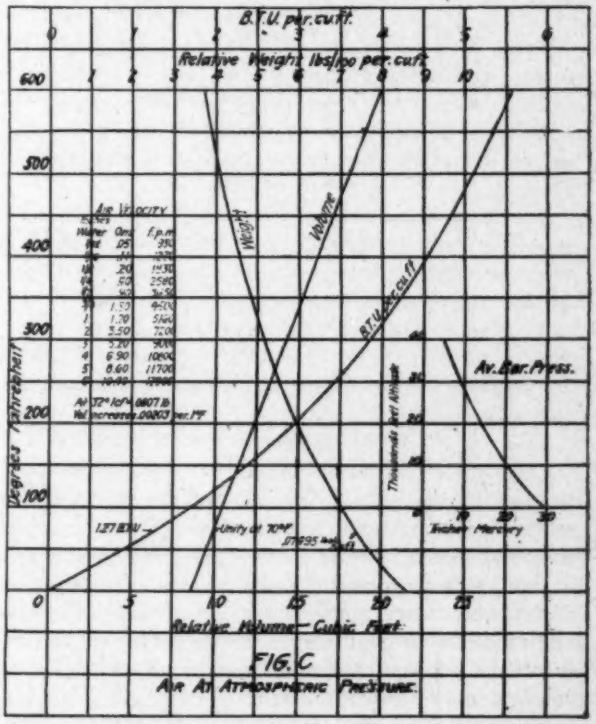
TABLE I—IGNITION TEMPERATURES

Combustible	*Symbol*	*Ignition Temperature*
Sulphur	S_2	470 F.
Fixed carbon—Bituminous coal	C	766 F.
Fixed carbon—Semi-bituminous coal	C	870 F.
Fixed carbon—Anthracite coal	C	925 F.
Acetylene	C_2H_2	900 F.
Ethane	C_2H_6	1,000 F.
Ethylene	C_2H_4	1,022 F.
Hydrogen	H_2	1,130 F.
Methane	CH_4	1,202 F.
Carbon monoxide	CO	1,210 F.

The temperatures of combustion hearths for powdered coal range from 2,000 to 3,000 F. degrees, depending on the design of furnace, the service and fusibility of ash and refractories employed. With these temperatures predominating the deflagration of all commercial coals is assured, and the restriction on any particular kind of coal for powdered fuel on account of combustibility is eliminated.

The suitability of coal for use as powdered fuel is to be gauged rather by its pulverizing qualities, and the soft grades, which incidentally contain large proportion of volatiles, are to be preferred. Hard coals and coke are very severe on the mills. For pulverizing, slack coal and all small sizes under three-quarters inch are more desirable in that they eliminate the necessity of crushing. Screenings which usually are fragments of the more combustible portions of coal are excellent for puverizing, on account of the lesser amount of impurities present.

Uniformity in the quality of powdered coal is as essential as uniformity in the fineness of the powder, and for continuous reliable service as essential as its calorific value. In preparing the powder, it is extremely important to mix and blend the coal so as to distribute its impurities uniformly throughout. The ill effects of the irregular presence of impurities are felt more as the quantity of fuel burned becomes smaller. When burned in large quantities necessitating larger combustion space there is a chance for equalizing the variations of the impurities. To obtain a uniform quality of fuel wherever the coal supply is of varying kind, the various grades of coal may



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be blended to advantage by pulverizing, thereby effecting economies which might not otherwise obtain.

Moisture in coal is objectionable not so much for the apparent thermal losses but because it renders pulverization difficult and more costly. For this operation 5 per cent moisture may be regarded as the permissible limit, and air dried coal is perfectly satisfactory for the efficient operation of the mills. However, in cases where the storage of powdered fuel is necessary, coal should not contain more

than 1.5 per cent moisture; a greater amount tends to cake the powder, and in the event of iron pyrites being present, their oxidation by water may be the origin of spontaneous combustion. It has been considered necessary to dry the coal before grinding; experience has shown that this practice incurs losses of volatile combustible and adds from 8 to 12 cents per ton to the cost of preparation. Furthermore, with reasonably protected storage, and handling facilities, it is possible to render the raw coal sufficiently dry and eliminate the separate drying operation. The present tendency in drying coal is to confine this process to central distribution plants, as will be required for railroad or large service. For stationary work, self-contained pulverizing units in which grinding, air mixing, and feeding of combustible mixture directly to the furnaces are progressively accomplished are more desirable, especially so since preheated air—a by-product of the furnace—can be used in their operation, thereby conditioning the mixture for better combustion performance.

In the combustion of powdered coal a certain amount of moisture is beneficial rather than detri-

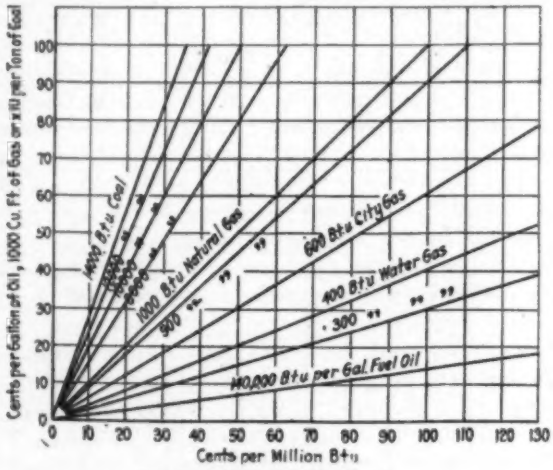

Cents per Gallon of Oil, 1000 Cu. Ft. of Gas or $ per Ton of Coal
Cents per Million B+u
1400 B+u Coal
1000 B+u Natural Gas
600 B+u City Gas
400 B+u Water Gas
140,000 B+u per Gal. Fuel Oil

Fig. D. Relative cost of fuels

mental in that it tends to maintain the temperature of combustion constant and thereby renders deflagration more steady. The explanation of this effect is that the normal temperature of dissociation of the solid particles of coal is greater than that of water, and in the process of combustion, some of the moisture that may be introduced with the charge breaks up, absorbing thermal energy thereby lowering the combustion temperature.

Powdered coal containing as much as 15 per cent moisture has been burned satisfactorily.* This amount is no doubt excessive, but by introducing preheated air for combustion of powdered fuel through the self-contained pulverizing units or otherwise, it is possible to absorb large proportions of moisture from coal and use this to advantage in the process of combustion.

The ash resulting from burning solid fuels has been and always will be a problem for each particular case. With powdered coal the ash from particles consumed in suspension is a light powder. This powder is carried along with the gases, and deposited on all surfaces beyond the hearth, making removal more or less difficult. In the case of boilers, this kind of ash accumulates on the tubes lessening the evaporative

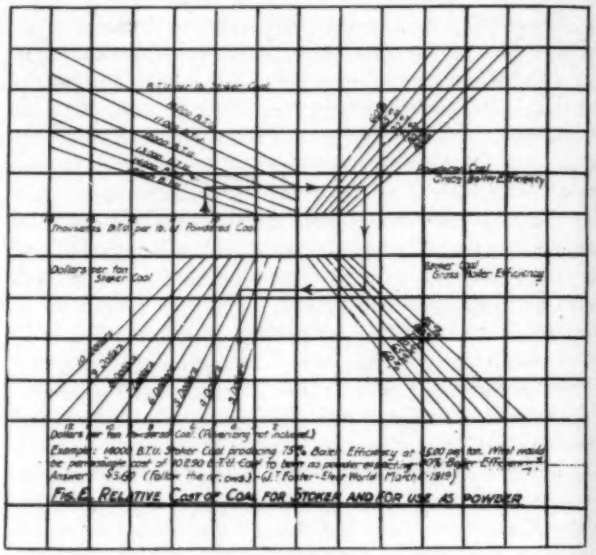


Fig. E. Relative Cost of Coal for Stoker and for use as Powder

efficiency, necessitating periodical removal by steam or air sprays. The dissemination of this ash can be somewhat reduced by proportioning the combustion space so that after combustion is completed the gases expand rapidly, decreasing their velocity and density, dropping the ash particles into a suitably located pit. If the powder is too coarse, or the amount of fuel injected into the hearth is greater than can be fully consumed therein, the coal particles while in the distillation stage are impinged against the walls and there coke. The continuous supply of these unconsumed particles builds up and burns slowly, leaving ash of a pumice stone formation, which if in the proximity of the zone of deflagration slags and becomes very difficult of removal. The remedy for this kind of ash is continuous production of uniform, fine-powdered fuel and the proper design of the combustion space to consume completely all the particles of the fuel charge.

On the whole, compared with lump coal burning over grates, the experience is that with reasonable precaution, ash from powdered coal is less troublesome in every way. Slagging of the ash and brick work occurs only when these are too near the deflagration zone, which naturally is several hundred degrees higher than their fusion points. This difficulty is eliminated by designing the combustion hearth so that the side walls and top arch obtain

*"Power." Volume 33, pages 269, 267, 1911. W. S. Worth. "Firing Boilers with Pulverized Coal," Henry Phipps Plant.

a temperature lower than the slagging point, and the bottom is no higher than about 2,000 degrees F, which avoids melting of the low fusible ash.

The presence of sulphur is to be looked upon with less concern in the case of powdered coal, since, as mentioned before, the high temperatures attending the combustion of this fuel dissociates water into its elements and holds these in a condition less liable to combine with sulphur. Powdered coal containing over 5 per cent sulphur has been used in boiler settings without giving evidence of corrosion.

The safety in burning powdered coal can be best expressed by saying that, while mine explosions attributed to coal dust indicated its combustibility, and the testing station of the United States Bureau of Mines in Pittsburgh has painstakingly shown that coal dust in suspension can be made to explode, powdered coal is an excellent fire extinguisher. To ignite it in any form, coal must be brought to the temperature of its ignition 1,000 F. degrees and above. This is greatly in favor of powdered coal since it permits its being conditioned for better combustion performance by heated air before using.

Combustion air for powdered coal has variously been applied under different pressures and usually at ordinary temperature. No judgment has yet been passed on the condition of the necessary air bearing either on the flame propagation qualities of powdered coal, or on the dimensions of the combustion space, and in the absence of definite experimental data, one guess is as good as another. Although the relative low deflagrability of the powder suggests it, it is only through costly experience that we have learned the advantage of low air pressure and velocities for combustible mixture.

The function of air in connection with burning powdered coal is not only to provide the proper amount of oxygen, to hold and convey the powder, or supply a dilution element, but to carry the flame —zone of oxidation—in suspension throughout its path, that is, away from the brick wall. The importance of this requirement is obvious, in that it eliminates destructive temperature and accumulation of ash and semi-burnt particles on the brick walls, and secures more perfect burning of the fuel particles "in suspension."

The value of heated air for mixing and dilution purposes can not be overestimated. It prepares the fuel for quicker deflagration, thereby permitting larger quantity of fuel being burned in a given space; it maintains the powder in better state of separation, and in general promotes steadier combustion. Furthermore, in conjunction with a suitably designed furnace, it is possible to attain a better heat balance by utilizing waste gases and radiation for heating the combustion air required for the treatment of the powder.

For mixing purposes the air temperature should not exceed that of the coking point of the particular coal used, and for dilution the higher the temperature of the air the better.

Comparative tests on a 250 H. P. boiler using combustion air at 65° F. and 750° F. with bituminous powdered coal showed, other things being equal, that with the ordinary air the evaporation was 7.7 lbs. per pound of fuel, the temperature of escaping gases being 528° F., while with the 750° F. air the evaporation was 9.17 lbs. per pound of fuel and the temperature of the escaping gases 475° F. On the basis of the normal boiler rating this performance indicated a gain of 15 per cent with hot air and a loss of 12.2 per cent with the ordinary air. (Power, Vol. 24, pp. 168-196 and 271, J. H. Travis).

At the present time air pressure from one-half ounce for small furnaces to 10 ounces and above for cement kilns are being used with success, while 3 ounces and under for boilers have given good results. As above mentioned, powdered coal should be burned in suspension and with excess air on account of the high temperatures that develop in its combustion. (See Fig. A). The pressure and distribution of the air necessary to secure this condition varies with each case and demands careful consideration to obtain best results.

In general, the finer the powder and the warmer the air of the mixture, the lower will be the pressure necessary to inject the combustible mixture into the furnace, and the better will the powder be held in suspension; also, other things being equal, the larger the amount of fuel that can be burned in a given space. This implies lower furnace losses.

Considered as a gas, powdered coal when mixed with 100 per cent combustion air produces a fuel mixture of from 90 to 120 b. t. u. per cubic foot. Figures D and E illustrate relative costs of fuels on the basis of their calorific values.

Economy in connection with fuels is a term which must be applied with caution, and must be based on the purpose for which fuels are used. If pyrometric effects are wanted as in metallurgical furnaces, the conditions and rate of burning fuel are such that thermal efficiency is out of consideration, and economy can only be expressed directly in dollars, regardless of the kind and performance of the fuel used. If calorific or straight heating effects are desired as in steam generation, thermal efficiency plays the all important part, and in this connection two factors are to be considered, one involves the furnace performance and combustion losses, and the other, the means provided to absorb the thermal charge in the products of combustion. These two conditions go hand in hand, and best economy is therefore a function of the two.

With powdered coal, furnace and combustion losses can be greatly decreased with respect to those incurred in burning lump coal over grates, by reason of its manner of burning, and it is to that condition

(*Continued on page* 724)

Electrical Power Equipment for Pulp and Paper Mills

By W. W. CRONKHITE

General Electric Co.

THE use of electrical energy in paper and pulp mills has grown so rapidly in the past ten years that today there is hardly a mill in the United States that does not use electricity in some form, and in many of them electric power is used throughout.

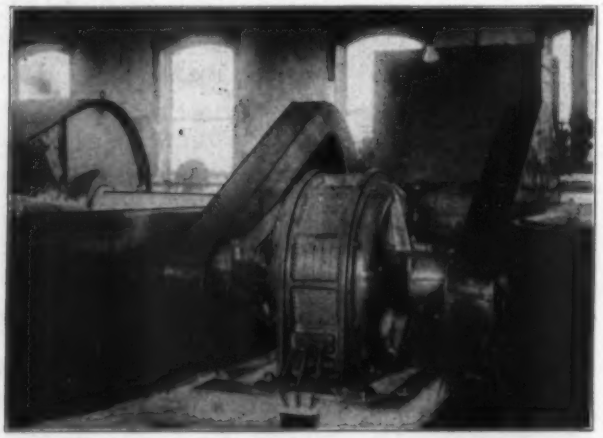
The engineers in the paper industry were quick to grasp the benefits of electric drive and a fair estimate of the electrical horse-power in use in mills throughout the country today is a half million.

Electricity is the most convenient agent for distributing power about the mill. It is also the most economical method of applying power to the machine, so in planning a new mill or revamping an old one, the engineer in charge must give considerable thought to the use of electricty.

In erecting a new paper and pulp mill, the engineer is, of course, confronted with the choice of the old, so-called mechanical or group drive with the numerous belts, long lines of shaftings, etc., and the up-to-date method of individual motor drive. Which method is the more efficient from an operating standpoint and which is more productive?

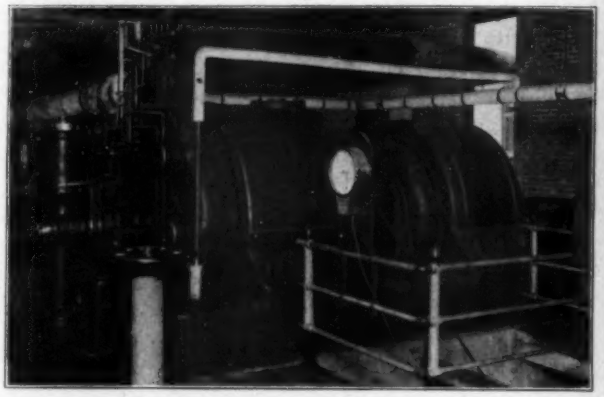
Increased Efficiency in Power Transmission

The final decision should not be based on theory alone; consider the actual working conditions found



150 H. P. induction motor driving 2 beaters through chain belts in a Wisconsin mill

in the average mill. The millwright is often fooled as to the efficiency of belts and shafting in transmitting power. Tests are usually made when everything is new and in good shape, but belts stretch and shafting gets out of alignment, which increase transmission losses. The ordinary method is to indicate



600 KW. 600 volt 40 cycle mixed pressure turbine of the International Paper Co's mill at Ft. Edward, N. Y.

the engine with all the machine belts on the loose pulleys. This gives the friction load, on which the advocates of the mechanical method base their calculations, but this condition is not one in which you are interested. The efficiency of the shafting and belting when the machines are not in operation is of no value to anyone. As soon as the machine belts are shifted to the tight pulleys so that the machines themselves are in operation, the conditions throughout the mill are all changed so far as torsion, deflection and other items are concerned.

With a long line of shafting there is always considerable torsional disturbance at the end of the shaft. With every change of load this spring movement acts. No such condition can exist with the individual motor drives.

In any industry the ideal drive is to connect the prime mover directly to the producing machine.

Savings in Power Consumption

Another point in favor of the individual drive is that power consumption ceases when production stops. This friction load is a mighty big item in the course of a year in a paper mill.

There are some machines in the paper and pulp industry that do not permit the elimination entirely of belts or chains. The beater, for instance, does not lend itself for direct connection, but wherever it is

possible to do so, use the direct connected motor. Shafting and belting have no part in producing pulp or paper, but are only a very expensive means of transmitting the power to your producing machine.

The speeds of belt driven machines vary from day to day and to keep them from doing so, would require a tremendous amount of work and attention. On the other hand, direct connected motor driven machines maintain their speed day after day.

Perhaps one of the greatest arguments in favor

Two type Ati-30—1200 H.P.—240 R.P.M.—440 volt motors, each motor direct connected to two 4-pocket grinders at Inland Empire Paper Co. Mill, Spokane, Wash.

of using electrical power and individual motors when erecting a new mill, is that the machinery can be located with a view to the elimination of all unnecessary handling of the product, as each machine can be supplied with its own motor if necessary and operated as an independent unit. The adoption of motor drive eliminates long shafts, heavy hangers and belts, and their cost and maintenance should be considered when comparing the initial expenditure.

Low Pressure Turbines

We have mentioned the advantages of electric drive in building a new mill. There is a splendid opportunity to effect a saving in old mills also. There are many old mills in the United States which use the old mechanical or group drive entirely, derived from either steam engines or water wheels or perhaps both. It may not be possible to figure a financial saving which would warrant a complete change over to electric drive, as long as the main mechanical drives are in good condition, unless very cheap power is available from some central station, but many old mills have one or more small engines driving the outlying machinery, such as saws, chippers, filters, machine shops, finishing machinery, etc. These engines are often high speed non-condensing throttling governor machines with high steam consumption and usually require long runs of steam pipe with the attendant loss due to radiation and leakage.

In going over such a mill, with the view of installing electric drive, it is evident that considerable saving can be effected by replacing these engines with motor drive. These mills offer an opportunity to install a low pressure turbine, running on the exhaust of the main engines and supplying power for driving the auxiliary machinery. A large Eastern news mill has a very successful installation of this sort, where the exhaust steam from the engines, driving their sulphite and acid plants, is used in a 600 KW low pressure turbine, which supplies power to motors driving pulp shredders, pumps, conveyors, cutter room machinery, machine shop and clay mixers.

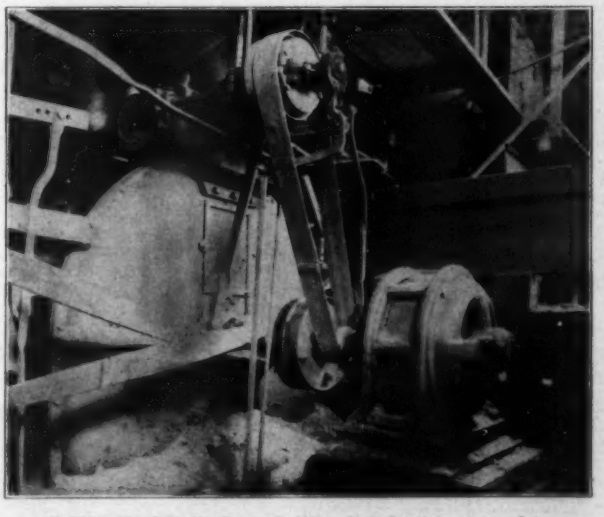
Such an example can be followed advantageously by other mechanically driven mills.

Wood Yard and Wood Room Application

It is not the purpose of this article to cover all uses of electric power in paper and pulp mills, but to make general recommendations in the briefest manner. Perhaps it wouldn't be amiss to take concrete examples. There is hardly a machine used in the industry that is not being driven successfully somewhere by a motor, but we will only consider the machines found in the average mill.

Conveyors

Let us start with a conveyor. The one illustrated here is driven by an induction motor of the slip-ring type. Power required for such conveyors varies with the height and speed of course, but many paper mill companies allow 5 h. p. per 100 feet of length when



15 H.P. 750 R.P.M. Form K 440 volt induction motor driving 5 ft. Barker at a Wisconsin mill

running at 200 feet per minute. This formula will not hold in all cases but is fairly close for approximating purposes.

Knife Barkers

Knife barkers are not as generally used as formerly, perhaps, but there are many of them still in use. Such an installation is useful in a mill where it often

becomes necessary to run a single barker to clean up a bit of wood, etc.

Squirrel-cage motors are to be recommended, but inasmuch as starting conditions are severe, due to heavy loads to be accelerated, it is important that an indestructible type of rotor construction be used.

Screens

Screens require very little power and group drive seems to be about the best method of driving them. Flats take about ¼ h. p. per plate. Rotary and centrifugal screens consume more. The power requirements vary for the different makes from 12 to 20 h. p. and one make which is somewhat larger than the others requires 30 h. p.

Centrifugals are driven by vertical motor or by belt using a quarter turn belt.

Chippers

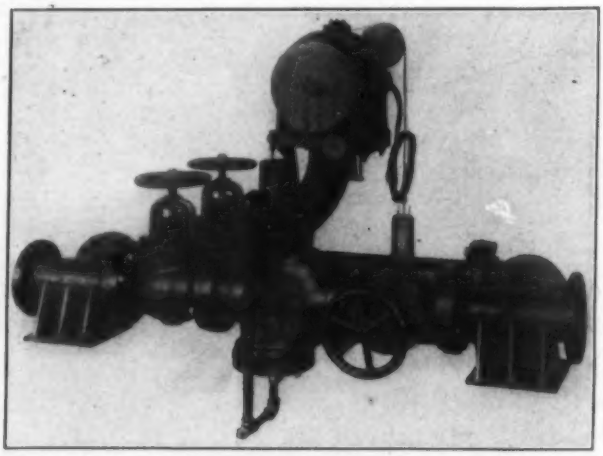
On account of the vibration motors should not be direct connected to the chipper. Test on a five-foot chipper working on spruce in two-foot lengths shows the average load was 56 h. p. Test on an 87-inch chipper showed a maximum peak of 115 h. p. and an average of 75 h. p. Of course, the power varies with the production of the chipper.

Pulp Mill Application

The grinding equipment is the largest consumer of power in the mill and motor driven stones are becoming more popular every year.

Motor driven stones are particularly desirable when it is advisable to locate the pulp mill at a distance from the water power. In some mills they are used to supplement the work of the water-wheel driven stones at time of low water.

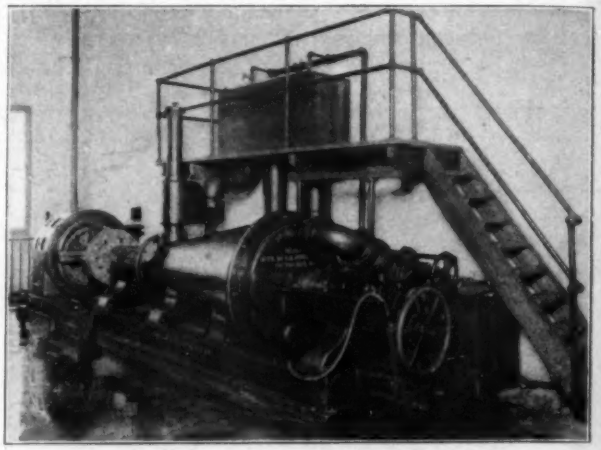
This motor application offers a fine chance for power factor improvement by the use of synchronous motors. The power required varies with the pressure. Some mills are using 300 h. p. for a 3-pocket grinder and some run as high as 600 h. p. per stone.



Load regulator for motor driven pulp grinder (front view)

Grinder Regulators

In connection with motor-driven grinders we should not fail to mention a new device that is now perfected and installed in several of the large pulp mills. This is an electrical regulator that keeps down excessive peak loads on the grinder motor, and by maintaining an even load on the motor, fills up the so-called "valleys" with pulp. One mill which is using this device and buying their electric power for the grinder motor reports that in the month of May, 1919, they ground fourteen cords more pulp wood and the power bill was $350 less than for the preceding month when the device was not in operation.



Motor driven Jordan at the Fenimore mill of the Union Bag & Paper Co., Hudson Falls, N. Y.

In the Beater Room

Beaters may be driven in pairs singly or in groups. The photo shows a popular method using chains, this same method with belts instead of chains is also generally used. Local conditions often decide the method of driving beaters. Some mill owners want a method that will allow them to shut down a beater without disturbing the rest of the machines. Recommendations depend entirely upon mill conditions.

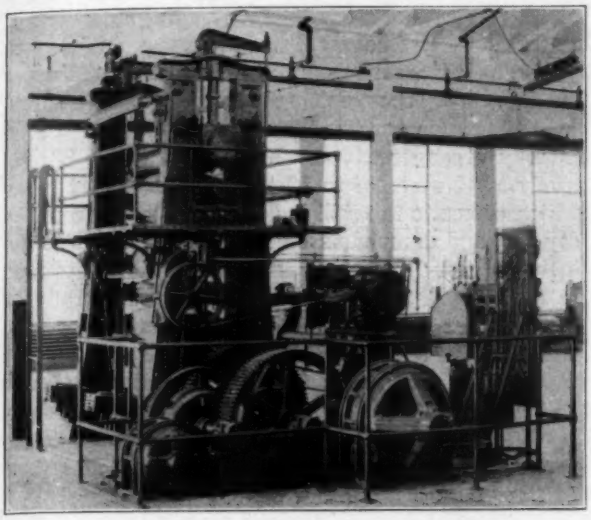
There is one type of motor, however, that is better suited for this service than any other and that is the slip-ring type. This type of motor will give you the high starting torque necessary for beater work.

The accompanying test chart gives a fair idea of the power required for beaters under different conditions.

Jordans

There is a distinct advantage obtained by driving Jordans with a direct connected motor. Its compactness, freedom from belts, long life of Jordan bearings and linings, uniform speed and, of course, a better grade of pulp. Did you ever notice upon opening a belt driven Jordan after it had been run a while that it was no longer round, but more or less egg shaped, that is, one side showed more wear than

the other, which, of course, means that the clearance between the shell and the plug is not the same. Running a Jordan under such conditions can not help but have a detrimental effect upon the quality of the pulp that passes through the machine. This undue wear is caused by the side pull of the belt. For Jordan service squirrel-cage, slip-ring and synchronous motors are all used, but the first named is the most popular for this class of work. Power required



75 h.p. motor and 7½ h.p. motor driving a 50-in. 9-roll paper calender at the Strathmore Paper Co., Woronoco, Mass.

for Jordan varies to such an extent that without knowing all details of just how the Jordan is to be used it is not safe to make definite recommendations. By manipulating the plug a Jordan can take almost any power. The power also varies not only with the size and capacity of the Jordan but with the nature of the stock. Some mills used their Jordans to help reduce the stock, other mills have plenty of beater capacity and only use their Jordans to refine or "brush" the stock.

Motors can be direct connected to any type of Jordan and this method of drive is highly recommended.

In the Machine Room

Many successful installations of electric drive for paper machines have been made in the past five years.

On account of the wide speed range usually desired, direct current motors should be used. In a great many mills where electric power can be purchased cheaply, electric drive eliminates the necessity of maintaining an engine for the paper machines alone. The paper machine drive should be studied carefully, because there are many cases where it is not economy to use motor drive on paper machines and live steam to dry the paper for steam engines exhausting into the driers may give an overall fuel economy higher than can be obtained otherwise. In new mills this problem is taken care of by using steam turbine in the power house and extracting low pressure steam for drying, but no hard and fast rule can be given to cover this, for a scheme that could be economical in one mill might fail in another.

A great many of the mills use an engine to drive a direct current generator which furnishes current to a variable speed motor for driving the paper machine, the engine exhaust being used to dry the paper. Oftentimes the constant speed shaft of the paper machines is driven off one end of the engine. The generator may of course be direct connected to engine, belted or rope driven from the engine.

Control for paper machines is more or less optional with the paper mill man. The electrical companies have developed several methods. Complete push-button control is used to some extent, but in most cases a push-button station for starting and stopping, and hand control for bringing paper machine up to its proper speed is used. It is a simple operation and requires no practice on the part of the machine tender.

In the Finishing Room

The so-called two motor drive is the best arrangement for driving super-calenders. These stacks work from 20 to 30 per cent of the time at threading speed and the power required at the low speed goes down directly with the speed. As the threading speed is usually one-tenth the calendering speed, the threading power is one-tenth the calendering power, so if a stack requires 75 h. p. to operate at top speed, only 7½ h. p. would be required to operate stack at threading speed. Thus, a 75 h. p. alternating current motor operating at 7½ h. p. load would be a very inefficient equipment. With the two motor drive, using a small motor for obtaining the threading speed and a large motor for driving the stack when operating at top speed both motors are operating at practically full load all the time. With a single motor drive the threading speed has to be obtained by inserting resistance in the rotor circuit. This makes the thread-

Motor operated wood conveyor at the Finch, Pruyn Company's mill, Glens Falls, N. Y.

ing speed very unstable as the low speed requires a speed reduction of about 90 per cent below normal. With single motor, direct current drive the threading speed can be made more stable than with the

(Continued on page 727)

The Handling of Paper Fillers

By E. G. MILHAM

Chem. Engr. Bryant Paper Co.

MINERAL fillers or loading materials are put into many grades of paper mainly for two reasons: first to give the paper certain desired physical properties such as "feel" and opacity, and second, to increase the weight of paper without increasing the quantity of the relatively expensive fibrous material. Since, however, the minerals added give the paper desirable characteristics, which could not be obtained otherwise, they cannot properly be looked upon as adulterants.

The Fillers Most Commonly Used

The fillers which are most commonly used at present are china clay, sulfate of lime, ground talcs, ground feldspars and carbonates of lime and magnesia. Some of these, notably the lime sulfates, the talcs and the feldspars, are sold under a variety of pet names such as "Pearl Fillers," "Crown Filler," and "Pearl Hardener." In general, these materials all vary somewhat in their physical and chemical properties, and it is usually not best to regard them as being entirely alike so far as their effect on the paper is concerned.

The Requisites of a Good Filler

The following are the requisites of a good filler:

1—It should be of a good bright white color, the degree of whiteness, of course, depending on the grade and color of paper in which it is to be used.

2—It should be free from grit and dirt.

3—When stirred up with water, it should form a smooth cream which does not harden quickly.

4—In case it is to be used in rosin sized papers, it should not foam when stirred up with alum solution.

5—It should be practically insoluble in water.

6—It should be free from soluble salts; that is, tasteless.

7—For reasons of economy, it should not, as a rule, contain much moisture.

8—Naturally, it should be capable of helping to give the paper the desired characteristics, such as finish, opacity, hardness, or "feel."

The Handling of China Clay

Since china clay (Kaolin) fulfills most of the above requirements remarkably well, it is the most generally used of all the fillers and the problem of handling it economically is of interest to all mills which use any great quantity of fillers.

As most superintendents know, it is usually bad practice to put dry clay directly into the beaters. The only really satisfactory method of handling the clay is by adding it to the beater in the form of a dilute water suspension or emulsion, containing about one and a half to two pounds of dry clay per gallon of water. This, of course, introduces the necessity of providing apparatus for mixing the clay with water and measuring the resulting mixture into the beaters.

In the accompanying sketch, is shown a very satisfactory arrangement for handling clay on a relatively large scale (5 to 10 tons per day). The clay which comes to the mill in bulk is unloaded from the car "A" and dumped through the chute "B" into the belt conveyor "C" by means of which it is transferred to the desired point in the clay storage bin "D." As required for use, the clay is loaded into a specially built cart and dumped into the mixing tank "E." The above mentioned cart should be so designed that it will always hold a definite volume and can be dumped easily. In this connection, it might be well to remark that the writer has always found it best to measure the clay to the mixers by volume rather than by weight, since, by this means, any variation in weight, due to the varying moisture content of the clay, is avoided.

Construction of Mixing Tanks

The construction of the mixing tanks "E-E" is worthy of some attention. They should be made preferably of concrete and each of them should be large enough to hold at least twelve hours' supply of clay emulsion. They should be provided with agitators which do not run faster than eight or ten revolutions per minute, since, if run much faster than this, they are apt to aerate the emulsion to such an extent as to cause foaming. Of course, one large mixing tank can be used instead of the two smaller ones. However, the arrangement shown in the sketch is much more convenient.

After the clay has been thoroughly mixed with the water, the resulting emulsion or milk is pumped up into the tank "G," which should be large enough to hold eight hours' supply of clay mixture and which should be provided with an agitator and a substantially built seventy mesh screen having at least four square feet of screening surface. Obviously, the pump "F" should be of adequate capacity to easily handle the maximum requirements for clay milk.

From tank "G" the clay is measured into the beaters by means of small tanks similar to "I," which are located directly over each set of beaters and which are filled by means of the pump "H." It is usually well, as a precautionary measure, to keep a cheese-

cloth sack tied on the delivery end of each pipe running from the measuring tanks, so that the clay milk is re-strained just before it enters the beater.

Handling of Other Fillers

The rest of the more commonly used mineral fillers are much more easily handled than the clay, since they break up in water much more readily and do not form a sticky, plastic mass as does clay. As a rule it is perfectly safe to dump the dry filler directly into the heater, provided, of course, that the filler in question is finely ground and contains no lumps or chunks. It is usually very bad practice to attempt to put these other fillers through the same process as must be used in successfully handling the clay, since they are relatively heavy and coarse by nature and usually cause no end of trouble by settling and forming tough mats in the clay screens, pipes and tanks. In case a filler contains so many lumps that it cannot be put directly into the beater, it is best to discard it or, if convenient, to put it through the clay process admixed with a large proportion (80 per cent or more) of clay.

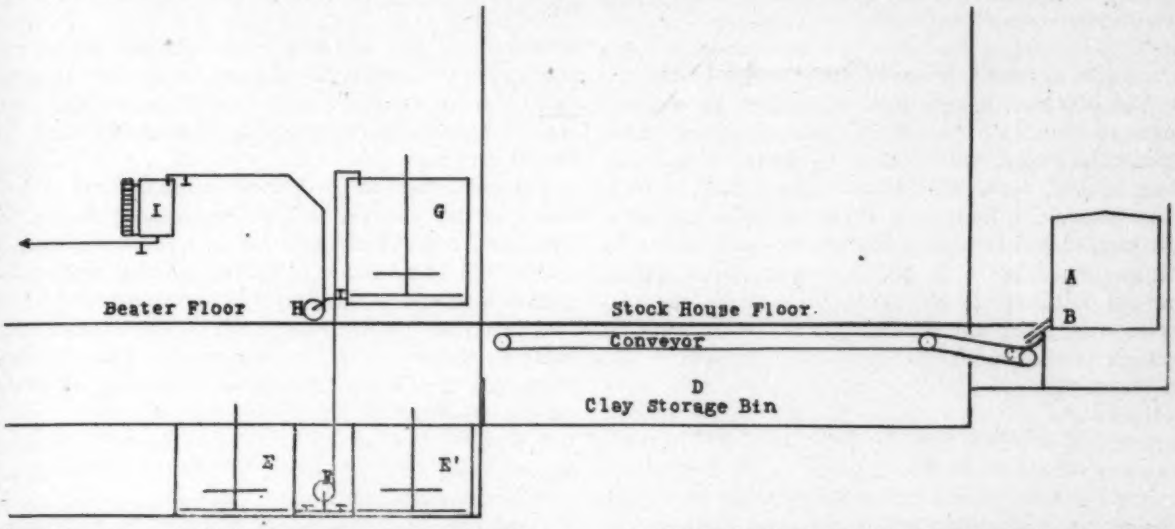
Storage of Fillers

The writer has sometimes been astonished at the carelessness he has seen in the matter of properly storing valuable loading materials. Among other things, he has seen hundreds of dollars' worth of calcium sulfate filler ruined because it was stored in a damp cellar where it drew moisture and became hardened. He has seen talc, in paper bags, stored in crowded passage ways where it was inevitable that they should be run into and scores of them torn open and their contents scattered. In more than one instance he has seen clay storage bins located so close to the power plant that it was a physical impossibility to either unload or use the clay without seriously exposing it to contamination by two of the very most undesirable materials—coal dust and cinders.

Of course, the above may be extreme cases, but they serve to point out the advisability, if not the necessity, of using care in the storing of mineral fillers. Most of the suggestions given below will be perfectly obvious to every paper mill man, nevertheless it might be well to put them down along with the added suggestion that several of them could be applied in many mills to good advantage. The suggestions for storing fillers are as follows:

1—The bin for bulk clay should be located below the level of the unloading platform and in a place which is convenient to the car as well as to the mixing tank.

2—It should be as far as possible from the power plant, and other sources of dust and dirt.



3—If convenient, the bin should not be located in a place which gets too cold in the winter time, since the water which is naturally in the clay is apt to freeze and make the handling of the clay more or less difficult.

4—The floor of the clay bin should be of concrete.

5—It is very convenient to have partitions in the bin so arranged that, when necessary, different grades of clay can be stored and kept separate.

6—It is no great disadvantage to have the clay bin slightly damp. However, the leaking in of water from the floor above or from other places should be carefully guarded against.

7—A conveyor in the clay bin, as shown in the sketch, is very convenient in cases where a large quantity of clay is used (5 or more tons per day).

8—All sulfate of lime fillers, with the possible exception of those having a crystalline, flakey nature ("Crown Filler"; "Fibrous Mineral Filler"), should be kept in a place which is absolutely dry.

9—All fillers which come to the mill in bags should be so piled that the smallest possible number of bags are exposed to the knocks of careless stock room truckers.

10—Fillers in bags should not be piled so high that

there is excessive danger of breakage in getting them down.

11—Protruding sharp corners, such as bolts and nails, should be removed from the trucks before they are used in handling bags of fillers.

12—Nails or other hard objects which might tear the bags should be removed from the space where filler is to be piled.

13—Fillers in bags should not be piled even temporarily in places where they are apt to get wet.

14—Every precaution within reason should be taken against the possibility of bags of filler becoming torn or soaked with water.

Conclusion

The above suggestions and recommendations are made with the full realization of the fact that conditions in different mills vary greatly. It is the writer's firm belief, however, that even in spite of these different sets of conditions, the above suggestions or slight modifications of them can be used to advantage in many mills.

Powdered Coal for Boilers

(*Continued from page 717*)

alone that very acceptable fuel economies can be effected by its use. Instances are recorded showing that 10,500 b. t. u. coal fired as powder in a given boiler setting has evaporated larger amount of water than 12,090 b. t. u. coal fired by hand. (Railroad Gazette, Vol. 34, G. F. Gashe). Invariably, records of tests made in a steam plant of various capacities using powdered coal as fuel indicate boiler thermal efficiencies of 75 to 80 per cent and above, which parallel best efficiencies obtainable with modern stokers in large installations. The consensus of opinion is that with the better methods of firing powdered coal, the high efficiencies observed, both in the hearth and in the boiler, remain fairly constant throughout a wide range of quantities of fuel burned, whereas with stokers which permit only a rigid design of combustion hearth, beginning with the higher efficiencies in large boiler installations, the efficiencies drop as the installations become smaller. This is self evident in part, since in stoker practice only the better coals can be used to advantage, and a certain amount of fuel loss can not be prevented, whereas by pulverizing, all grades of commercial coals are admitted to the same service with equal merits and fuel losses may be avoided. And since deflagration, and therefore the combustion space necessary, becomes a measure of the actual amount of combustible present in the coal, the hearth losses remain practically constant for all conditions met in actual service.

The conclusion to be derived is that, other things being equal, the competition between the use of powdered coal firing and stokers for large boiler plants will be a matter of flexibility of service, convenience in operating, and maintenance cost; while in small plants, fuel economy will be the deciding feature along with the other advantages, and powdered coal will obtain the preference, not only on the basis of combined first and operating costs, but especially so after the greater convenience and flexibility of service resulting from its use has been sufficiently demonstrated.

Conclusive judgment on the operating and maintenance costs of pulverizing equipment has not yet been obtained from acual practice, since no specific standards have been established.

With self-contained pulverizing units it is thought that totalizing all the items of expense, the operating costs of an equivalent stoker outfit are approximately the same.

Effect of Soot on Boiler Efficiency

By ROBERT JUNE

OF ALL sources of preventable waste, that of the formation of soot on the fire surfaces of the boiler is the most troublesome. Air leaks in the setting may be found and hermetically sealed. Losses due to radiation may be largely eliminated by proper insulation of the pipes, and losses caused by excess air drawn through the grates may be done away with in a large degree by the installation of stokers and draft gauges. Scale may be removed by cleaning at regular intervals. It is a job usually requiring time and patience, but the periods of cleaning are comparatively far apart. The formation of soot, however, cannot be stopped by any permanent means. It is an ever present source of trouble. Its deposit on the fire surfaces of the boiler is an ever continuous process.

Soot is almost the best insulator known. In non-conducting properties it has been proved to be more than five times as effective as fine asbestos. More heat would be transmitted to boiler tubes through a full one-inch wrapping of asbestos than through one-fifth inch coating of soot. The table below is from Kent's pocket book:

Water Heated Through Various Substances

Thickness of each substance temperature applied to each 310 deg. F.

Temperature increase of water in each case.....10 deg. F.

	Substance	No. pounds of water heated
1.	Loose wool	8.1
2.	Loose lampblack (soot)	9.5
3.	Hair felt	10.3
4.	Carded cotton wool	10.4
5.	Fine asbestos	49.0

A perfect clean boiler tube, ⅛-in. thick, will transmit forty times as much heat as will a tube covered with 1 in. thickness of soot.

The loss in heat conductivity of boiler plate, due to soot deposit, may be noted in the following table:

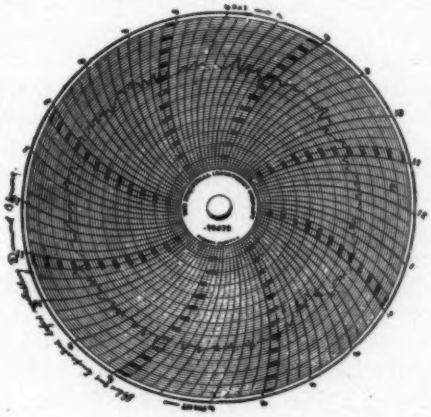
Thickness of soot	Per cent of loss
Clean pipe	0.0
1/32 in.	9.5
1/16 in.	26.2
⅛ in.	45.3
¼ in.	69.0

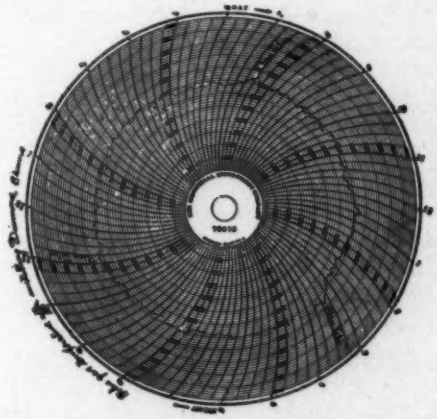
Fortunately, soot does not collect on all surfaces of a boiler in the same proportion. Some portions may be fairly clean, while others are thickly coated. This does not lessen the fact that there is a wasteful expenditure of fuel and heat wherever a portion of the tubes is soot coated.

What Soot Is

The principal constituent of "pure soot," or lampblack is carbon. Mixed and associated with this carbon are various tar products and acids.

Soot as found in steam boilers varies considerably in appearance and composition, depending upon the grade of coal burned, condition of combustion, and the part of the furnace from which the sample is taken. Nearest the fire deposits formed consist largely of ash. Analysis of samples of soot taken from the first pass of a boiler shows in addition to the "pure soot" the presence of silica, alumina, iron, oxide, various alkalis and sulphur dioxide.





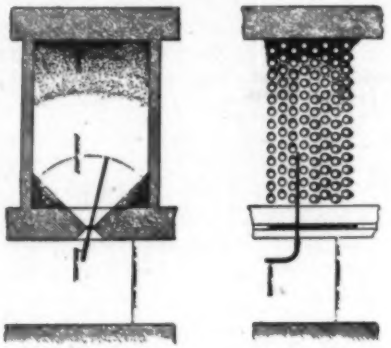
In color soot varies from black to gray, grayish white, grayish green, grayish blue, brown and reddish brown.

In all but the coolest portion of the setting soot is usually gritty in texture. The grains may be as large as medium sand or fine as cigar ash. The particles are in a plastic state when they leave the furnace and, striking the lower portion of the boiler, they adhere to the tubes.

If this deposit is not removed frequently it quickly

increases in amount and changes in character. The carbon burns out in part and the mass cements together. The repeated reduction in heat absorbing surface increases the temperature of the flue gases, so that the process of cementation is continuous and constantly increasing in intensity. An extremely hard clinker-like formation results. In a short time the space between the tubes in some portions of the boiler is entirely blocked, thus materially reducing its capacity. In this condition mining operations alone will remove the deposits.

A bad feature of these deposits is that if they are allowed to remain, the corrosive action of the various



constituents of the soot is exceedingly apt to cause leaky tubes. Under the influence of heat a ferrous carbonate is formed. The excess of air that is always present brings free oxygen in contact with the ferrous carbonate, and the reaction produces ferric oxide and carbonic acid. Carbonic acid, particularly in the presence of free oxygen, acts very rapidly on the metal of the boiler. Another source of corrosion is the sulphur dioxide in soot, which changes first to sulphurous acid and then to sulphuric. Only the boiler insurance companies know how many boilers are condemned annually as unfit for operation years before their natural period of service would terminate. That the number is very high we know, for cases are constantly coming to light.

Hand Cleaning Not Effective

It is a mistake to think that soot can be removed by the hand-hose method (using steam, through rubber hose and nozzle). The use of this system arose in the sheer necessity for removing some of the deposits from the tubes. It is admittedly an inefficient and expensive process, as well as being an extremely disagreeable and, to a certain extent, dangerous task. Two men are required, one close up to the boiler setting, frequently on a ladder (a delightful position on a summer day), and the other at the steam valve. The time employed is usually from 20 to 30 minutes. The nozzle is inserted, the spray of steam goes into the boiler, but whether it reaches all of the soot-covered parts of that section the fireman doesn't know. There is a large section near the cleaning door which he cannot reach at all. He is using a large supply of steam and he is letting an im-

mense amount of cold air into the furnace. When he moves to the next location he will blow some of the soot back.

Says the Author of "Furnace Efficiency"

"I was talking one time with a manager of a very modern power plant in the very modern city of Minneapolis. We got around to the subject of soot, and the engineer said: 'I will show you that we keep our boiler tubes clean.' He raised the slide from one of the blow holes at the first pass in the boiler. There was a good light from the furnace just below the tubes and we had a fair view of them. They were reasonably clean. We then went to the back pass of the boiler, but there was no light from the furnace there and we could not see anything. While the engineer was in search of a light I found a piece of gas pipe about six feet in length and thrust this through one of the blow holes in the last pass and across the tubes of the boiler. I could tell by the feeling of the pipe that there was a surprise in store for my engineer friend. The flashlight showed furrows an inch deep where I had plowed with the gas pipe across the top of the tubes.

"Now it is evident that the man who had charge of cleaning these tubes had not finished the job. He had blown soot from the first pass back into the second and a double dose of soot from there back into the third. Then he had stopped. Now if things like that can happen in a well-regulated plant, what can we expect to find in plants that are not regulated?"

To clean off soot properly all of it should be blown off from the tubes. To blow it from one locality to another does not help much. It is no uncommon thing to find soot so thickly packed into the corners, along the side walls of a water boiler, that you could use a hoe and shovel in removing it.

You want your boiler tubes to conduct heat as rapidly as possible to the water within the tubes. If you want to keep up steam when the soot piles up, you will have to pile in more coal.

The five essentials in preventing soot waste are:

(1) Frequency of cleaning in order to minimize the cumulative effects of increasing deposits. Tubes should be blown three to six times a day.

(2) Thoroughness of cleaning, in order to main-

tain high furnace and boiler efficiency and prevent destructive corrosive effects of soot accumulation.

(3) Availability of system. The soot blower system should be instantly available, automatic in action, capable of rapid operation.

(4) Durability of system. The blower units should be so designed and constructed that they will withstand the stress of hard service when placed in the hottest portions of the boiler without necessity for frequent repair or replacement.

(5) Economy of operation. The soot removing system should require less steam and labor than hand blowing; it should be so installed as to prevent the entrance of cold air into the furnace during its operation; it should pay for itself from an investment standpoint.

The modern mechanical soot blower of the best design fulfills all of these requirements. That it is a paying investment is well illustrated by the fluegas temperature charts shown herewith, as well as by many detailed tests, of which the following is typical.

Soot Blower Tests

The following extract is from a report by J. A. Moyer, member A. S. M. E., former professor of mechanical engineering, Pennsylvania State College, covering a comparative test on a B. & W. boiler at the college power plant, equipped with the Diamond Soot Blower system:

"The comparison was made as regards operation by making two tests with the usual method of hand cleaning the tubes with a steam nozzle, blowing them off every three hours. A second set of tests was made when the soot blower was used for cleaning the tubes every three hours. Clearfield coal, having a heating value of approximately 13,650 b. t. u. per pound of dry coal, was used in all of these tests. The actual heating value was determined with an oxygen bomb calorimeter for each test and the efficiency then calculated on this basis. Duration of tests one and two was approximately eight hours, while tests three and four were each for 24 hours.

Load conditions good.	Test No. 1 without tube cleaner	Test No. 2 with tube cleaner
Water evaporated per lb. of coal as fired, lbs.	8.06	8.72
Equivalent water evaporated from and at 212 degrees per lb. coal as fired, lbs.....	9.50	9.97
Equivalent evaporated from and at 212 deg. per lb. of dry coal, lbs.....	9.61	10.06
Efficiency, including grates, per cent.....	68.3	71.5

Saving of coal $\frac{71.5 - 68.3}{.683} = 4.7\%$.

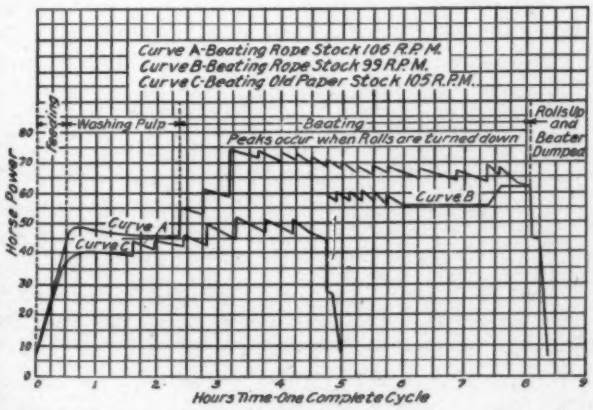
That the paper mills of the country recognized the value of mechanical soot blowers is evident from their large volume of purchases of this equipment.

Illustrations accompanying this article were supplied by the Diamond Power Specialty Company.

Electrical Power Equipment

(*Continued from page 721*)

single motor alternating current motor drive, but is not nearly as good an arrangement as the two motor



alternating current equipment. The control for super-calenders is generally by push-button and very simple.

Platers

For years platers have been driven by a light and loose pulley to get the reversing motion, at the present time, however, the mills are getting away from this old belt shifting device with its expensive upkeep and noise and installing a reversing motor drive.

The Steam Turbine

The steam turbine is fast becoming popular to paper manufacturers as it gives ideal flexibility with respect to steam utilization. The mixed pressure turbine has been designed for mills whose supply of exhaust steam from existing engines considerably exceeds the drying and heating requirements. This turbine takes this exhaust steam at slightly above atmospheric pressure and expands it down to a 28-inch vacuum, producing almost as much additional power as given by the engines themselves. The extraction type of turbine is also used much in the industry. This type is designed to operate condensing and uses high pressure steam, but low pressure steam can be extracted. There are many possibilities of electric drive in paper and pulp mills, but electricity is not a cure for all ills and care should be used in applying motors to the various machines, as there are certain types of motors that are best suited for certain machines used in the manufacture of paper and pulp, and it is always best to call in some one who "knows" when electrifying your mill.

The Paper Mill Cost System

By W. T. SCHMITT

American Writing Paper Company

(*Presented at the Meeting of the American Pulp and Paper Mill Superintendents' Association on November 6, 1919, at the Congress Hotel, Chicago*)

ANY cost system which is built upon recognized principles and essentials, that will give you correct results, and help you to make a better product at the cheapest possible price, will fill the bill as far as you are concerned. I suppose that almost all of you are satisfied to leave the working out of the mass of details to your dear enemies, the Cost Accountants, what all of you, however, are or should be interested in, is the cost of the product you are making. What the most of you are not interested in is the method of cost accounting, and what many of you positively dislike about cost systems is the Cost Accountant. With your permission I will take the last point first.

I have already referred to your dear enemy, the Cost Accountant. There is no denying the fact that in the past there has been a little friction between the paper mill superintendent and the cost accountant. The fault as is usually the case, was more or less mutual. Many of the older cost systems were not sufficiently flexible for the needs of an industry so complex as the pulp and paper industry undoubtedly is. Many of the cost accountants thought that a paper mill could be run somewhat like a set of accounting books, and that as long as they had worked out a cost system that worked beautifully in theory, all they had to do was to install their system in the mill; provide a plentiful supply of complicated forms, which to anybody who had not studied modern accounting methods, looked like inscriptions on an Egyptian tomb, and the thing was done. In other words they tried to make the mill fit the system. Then when results were less than zero they would raise a holler about lack of co-operation on the part of the superintendents. On the other hand, there is no denying the fact that many of you gentlemen have not given to cost finding the serious consideration which owing to its great importance this subject is entitled to.

Many of you have been a little suspicious of the cost accountant, and disliked to have him prowling around in the mill studying the manufacturing processes. Some of you undoubtedly were afraid of interference with your way of doing things. When we started to install our new cost system at the De Pere plant our superintendent, Mr. Chas. Garvin, reminded me very forcibly of a part of an old nursery rhyme about the man in the moon who sails in the sky—the part I am referring to is: "And the big bear growled." Well, gentlemen, that was in the beginning, but the big bear is not growling any more. He has recognized the benefits that he is deriving from our system, and the help that it is giving him. I was reading the other day the excellent paper on the pulping of hemlock wood by Mr. Dan O'Connel, and was very interested in what he had to say about the relative importance of the two questions, how much sulphur are you using per ton of pulp and how much pulp are you producing per cord of wood? Well, gentlemen, right here is where an efficient cost system steps in, and not only provides the answer, but brings out strongly the relative importance of the points at issue.

It certainly shows up the high spots and provides an antidote for preconceived or suggested ideas as to what is important in the manufacturing processes. It would require some salesmanship to make an executive believe that the article the salesman wishes to sell is of prime importance, when the monthly cost summaries which tie up with the ledger, and therefore with the profit and loss account, deny this statement both convincingly and insistently. Another point that suggested itself to me was in Mr. Henry Bert's very interesting paper on a standard quality of chip-board. Mr. Bert referred to the so-called "improved" methods of sorting raw stock now being practiced by the large packers, and the great differences in the quality of the various lots received. Here also an efficient cost system is invaluable to you.

You know through personal observation that a certain lot of raw material is not up to standard, and lodge a complaint with the purchasing department. But can you tell just how bad the lot was; how much more it cost you to sort this lot than an average lot; how much it retarded your production and thereby boosted your operating cost? An effective cost system will give you correct analysis of every lot which passes through your sorting department, thereby enabling the purchasing department to get back at the shipper and eventually to weed out the trusting souls who profess to believe that board or paper can be made from rubber boots or horse shoes. As Mr. Bert says, if you want to standardize your finished product you have to begin with the standardization of your raw material, and in order to set up certain standards you have to have the reliable data which only an efficient cost system can give you.

I will take a fine paper mill for example. The rag reports will show you at a glance whose rags are good from your point of view and whose rags have been subjected to the "improved" methods of cer-

tain packers. Your report will show you exactly how many pounds of baled rags it took to get a bleach of say 10,000 lbs. of thirds and blues, for instance; the weight and nature of the outthrows and the number of hours it took to sort the bleach, and finally the average weight and price per car of boiled rags as they leave the rotaries. From these reports you can easily establish standards, that is to say, you can stipulate that the amount of outthrows should not exceed a certain percentage of the baled weight, that the rag room cost, in other words, the number of hours it should take to sort a bleach of any given kind of stock should not exceed a certain amount. Shipments that do not come up to these established standards are then automatically reported by the cost department to the purchasing agent with all the supporting data, the shipper can be warned, a charge back made and in case of repeated offenses the shipper's name is taken off the list of suppliers.

The same principle, of course, applies to all other materials used in the manufacture of paper and in this way a good cost system will help you to standardize your raw materials. You not only have to standardize your raw material, you also have to standardize your furnishes. In theory, this is a simple thing, but you know better than I do how difficult it is to translate this theory into practice. Again I take a fine paper mill for example. Here you have quite a formidable number of standard grades for which you have worked out standard furnishes. How do you know that your instructions are being followed conscientiously all the time, unless the consumption of the various raw materials as shown on the monthly summaries of beater orders, tallies with the consumption as shown by the monthly inventory? You specify in your standard furnish one car of one kind of stock, one and one-half cars of another kind, and one-half car of yet another kind, and so many pounds of a certain grade of sulphite. How do you know that the car weights for every engine are approximately the same? You know that if you start digging from the top of a drainer that has been standing for some time you have to have more volume of stock to fill your beater than when you dig from the bottom or up and down. Here, again, the cost accountant helps you with a system of car equivalents, an accumulation of figures which eventually gives you the correct average weight for every car of stock regardless of grade, provided, of course, that all stock is dug in the same manner.

Then there is the question of machine broke coming back into the beaters. In the case of a high rag content paper the machine broke may cause quite a difference in the quality of the first few thousand pounds as compared with the balance of the run unless the furnish for such beater engine receives a fair supply of machine broke, so as to neutralize its effect. An effective cost system will give you the closest control and help you to standardize your furnishes. Speaking of broke I know that this is a subject of equal importance to all of you. The superintendent who says that he makes no broke, and is not interested in the subject, runs the danger of being bracketed with Ananias. There will always be broke in a paper mill and lots of it, but while a cost system cannot prevent broke from being made, it is the most effective check that you could wish for. It will tell you in detail where the broke is made and when, and in many instances the reason why. It will tell you how much machine broke there is in the total, how much calender broke and the cause of same, and how much sorting broke and the reasons for it. There may be many reasons: Dirt, crushed sheets, wrinkled sheets, uneven sheets, off color, etc., and these reports that come to your desk from the cost department every morning, show you correctly and insistently where it is necessary for you to take steps to remedy the fault. If the dirt is due to careless sorting of rags, here is your chance to go right after the rag room boss; if the fault lies with the machine tender, here are the figures which he cannot argue against. Perhaps the paper is being sorted too closely, because the customer demands a sheet that is rather better than the price he is prepared to pay warrants. Well, here are your figures right at the beginning, before any great damage is done and large contracts accepted by the sales department. The figures show that this particular grade cannot be made at that price, and it is up to the sales department to convince the customer.

Then there are the comparative statistics which a good cost system will give you without any additional trouble. You know, of course, from your machine reports how much paper is made per inch per hour, but do you know the efficiency of your supercalenders, sheet calenders, cutters, etc.? These details are contained in the figures which the cost department has to compile anyhow, in order to get correct costs, and they provide excellent help to you in detecting and weeding out loafers. An effective cost system is the most valuable servant that you superintendents can wish for if you will only use it right. You have your fingers on the pulse all the time.

There is no operation that is not analyzed for your benefit; there is no argument that you could wish for in the discussion of your manufacturing methods that an effective cost system will not readily supply, and there is this further point, a point which you are vitally interested in because it affects your pocketbook, and this point is that you know all the time whether or not you are making money. Your cost reports show you if you are getting dangerously near the limit, and almost invariably show you, at the same time, the reason why you should get busy and tip the scales the other way. I suppose that most of you have some kind of a bonus agreement. Now, I ask you, gentlemen, is it not a nice feeling to know all the time that your bonus is a certainty? Would

A Few Notes on a Power Plant for Box Board Mills

By B. M. BAXTER
Engineer and Mill Architect

OWING to the fact that a large amount of power is required in the manufacture of box board, and the cost of power is a considerable portion of the conversion cost, considerable attention should be given to securing economical power production through the installation of first class steam power plant equipment. In the best mills, all means are employed to secure economy of labor and economy of coal consumption, by the installation of coal and ash handling equipment, mechanical stokers and frequently economizers and superheaters. It is only through the adoption and proper operation of such equipment that the lowest power cost can be secured. The ratio of coal consumed per ton of board produced, ranges from about 1,400 lbs. to 2,000 lbs., varying with the grade of coal used, equipment installed, efficiency of operation and season of the year. Eliminating the effect of variation in quality of coal, the boiler horse-power load per ton of product per day will vary from sixteen to twenty-two, or for a one hundred ton mill, the average developed boiler horse-power will range from 1,500 to 2,200 boiler horse-power.

Selection of Boiler Room Equipment

In the selection of stokers, the prime consideration is adaptability to the kind of coal likely to be used. Extreme flexibility is not required, as there are no great or sudden variations in load except such as are experienced due to shutting down of the beater room or other abnormal conditions. Consequently the design of an economical and efficient boiler plant for a box board mill is much the same as that of any other plant operating continuously.

Engines of Corliss Type Are Suitable

Until recently board mills have been operated by power transmitted mechanically and generated almost altogether by Corliss engines, these engines being particularly suitable for the continuous heavy load, and as a class are more economical in steam consumption. Water power is used in some exceptional cases but as drying and heating of beater furnish water absorbs practically all the exhaust steam produced by economical engines, there is no particular advantage in water power for board mills, particularly those making medium and heavy grades.

Variable Speed Engines

The variable speed shafts of machines were formerly driven by the same engines that drove the constant speed lines through mechanical speed changing devices, but these have largely been supplanted by variable speed engines with independent drives for the constant speed shafts. These variable speed engines are usually twin engines, equipped with a mechanical speed changing device inserted in the governor drives. Slide valve, non-releasing Corliss valve and trip gear Corliss engines are used, the two former types being controlled by means of throttling governors. In the last type, the speed changing device may be connected directly by means of a flanged coupling to the spindle which would otherwise carry the governor pulley of the standard Corliss governor.

The Power Requirements

The power required for driving the beaters and Jordans and other beater room equipment—agitators, stock pumps, etc.—may safely be taken at 10 indicated horse-power per ton of daily output. The machine constant speed line load will vary considerably, mainly depending upon the installation of suction rolls on the machines, as the vacuum pumps of the suction rolls require considerable power—about 40 horse-power each for a 120-inch machine. Without suction rolls, 75 horse-power will generally be sufficient for a five-cylinder machine of the above width, while with suction rolls, the total power required may be as much as 200 horse-power for a large machine. For more exact calculation, screens may be estimated to require ¼ horse-power for each screen plate, stock pumps will require 7½ to 15 horse-power depending upon the size, and vat pumps 10 to 15 horse-power each. There seems to be an opportunity to reduce the power required materially by the installation of high duty pumps on the vats, but machine builders still adhere to the common type of beaver tail fan pumps of crude hydraulic design and low efficiency.

The power required by the variable speed line shaft will vary almost directly with the machine speed. For this character of load, variable speed engines are particularly suitable, as the engine power with a fixed point of cut-off will also vary directly with the speed and accordingly, if properly proportioned to the load, a variable speed engine will always operate at an economical point of cut-off.

As a fair approximation of the power required, a six-cylinder machine, 120-inch trim, with three presses, up to 90 or 100 dryers, three calender stacks, cutter and winder should require not over one horse-power per foot of paper speed per minute and with

good lubrication the power consumed should be materially less. As the load is almost entirely a friction load, the efficiency of lubrication has a large bearing on the power required.

Electrical Variable Speed Drives

Electrical variable speed drives are being installed to some extent and are desirable in cases where a saving in labor otherwise required for attention to an engine can be made. Electrical drives are also desirable because of ease of control, as the control mechanism can be located at any desired point near the machine. When installing an electric drive, care must be given to have it large enough for the maximum speed at which the machine may be operated, as this type of drive lacks the latitude of load range possessed by the variable speed engine.

Direct current is required to obtain the range of speed usually needed, and is obtained both by control of the motor and by variation of the voltage. For this reason, a separate generator is required for each drive.

As most mills equipped for electric drive throughout are driven by alternating current, the machine drive usually takes the form of an alternating current motor driving a direct current generator and direct coupled, the power from the generator being used solely in the variable speed motor of the paper machine. As the motors driving the beaters and Jordans must be slow speed motors, the power factor is necessarily low and the motor generator set of the paper machine may be used to effect power factor correction over the entire system by installing a synchronous motor of large capacity relative to the power required. This motor is then adjusted to operate with a heavily leading power factor which to a material extent counteracts the lagging power factor of the remainder of the system, reducing the heating of generators and motors and affording better speed regulation.

The amount of power required by board mill finishing rooms is very small and can usually be neglected when providing for the power requirements of the mill.

Careful Belt Computations

(*Continued from page 731*)

a 61-inch driver running 150 r. p. m. will turn the driven 201.1 r. p. m. One revolution on a 61-inch pulley repeated during a ten-hour run would make a considerable difference in the output of a plant.

"If you wish to do it as it should be done for absolute accuracy the speeds of your driver and driven should be taken simultaneously through a ten-hour period with a speed counter attached to each. From the total the r. p. m. could be easily and accurately figured.

"We are very glad indeed to know you are interested in this matter of belt slippage. We have been urging users of belts to look into this matter for more than twenty years. You are on the right track."

I have copied the above extracts from letters just to show the keen interest that is being aroused in power loss due to belt slip and the enormous savings that can be brought about in Uncle Sam's domain if everybody would just get together and make up their minds to cut out this needless slip and consequent waste. For example, in the above case, my friend estimated the loss per year to be $180 due to slip alone on a single belt.

One portion of the above letter that should be especially borne in mind is that it is virtually impossible to make one pulley run "exactly" 200 r. p. m., and its running mate to run "exactly" 150. You can't talk in "round numbers" like this and talk accurately. It would be more accurate to talk about "so many r. p. m. per ten-hour day." Let's eliminate the guess work and get right down to accurate figuring."

The Paper Mill Cost System

(*Continued from page 730*)

attends these meetings regularly, drop in yourselves when you feel like it, you will be surprised at the benefits that you personally can derive from this and the valuable practical aid that you can give to the cost men.

You have nothing to fear from any cost system. If your manufacturing methods were faulty you would not be in the prominent positions you now occupy. It is for you to tell the cost accountant the things you do and he will tell you how much it costs to do these things. It is not for him to suggest that things should be done in this way or that, it is for him to apply the correct principles of cost finding to the data furnished by you and devise a system that will meet the conditions peculiar to your particular mill. Co-operation in this as in all other things spells success and the closer the co-operation between you and your cost department the greater the benefit to yourselves and your companies. Bear in mind that a mill that is making money and plenty of it can, and does, command the best talent in the country, and that sound manufacturing methods backed up by an efficient cost system will carry you to that pinnacle, to which we all aspire.

Factors Affecting the Durability of Structural Wood and the Most Practical Methods of Preservation

Part II—Preservation of Wood Applied to Miscellaneous Timber Structures, Mill Construction and Dwellings. Methods and Procedure of Preserative Treatments

By KURT. C. BARTH

Miscellaneous Timber Structures

A great variety of timber structures are used throughout the country for coal, sand, gravel and ore storage; tanks, vats, mine operations and numerous other purposes which it has not, as yet, been found desirable to replace with steel, concrete or other material. The factor of decay and the conditions furthering its development are very similar in each so that they may be discussed as a group. The period of service which such structures will render is dependent (1) upon the natural durability of the species and grade of wood employed; (2) mechanical influences, and (3) period of usefulness as determined by factors other than mechanical or physical fitness.

The selection of the method of preservative treatment is dependent upon the relative importance of these chief factors. Permanent structures warrant the expense of thorough impregnation with creosote by the open tank or pressure processes, as may be found most suitable. Temporary structures are generally given surface treatments as a preventative measure, as but a limited increase over their natural life is desired. The preservative is applied to the timber at points of contact previous to erection and sometimes refined creosote is then applied, instead of paint, to the remaining surfaces after completion.

Mill Construction

Preservative treatment of timber used in mill type buildings is specifically recommended in recent standard specifications drawn by various technical bodies. The general tenor of these recommendations is that all ends and points of contact where experience has proven that decay will develop shall be given at least two brush coats of coal-tar creosote oil. Girders, beams and joists which are in contact with walls at one end and columns at the other should be carefully cleaned and two coats of refined creosote oil applied with a brush to a point several inches beyond the actual bearing surface. The ends should also rest on cast iron plates or in joist hangers and bearing surfaces of columns may be given additional protection by inserting at the ends a piece of felt or paper saturated with creosote oil. Columns should be likewise protected, and similar treatment of all ends of timbers between floors will prove beneficial.

Laminated flooring should be creosoted wherever possible, i. e., thoroughly impregnated by the open tank or pressure processes, depending upon the species and grades of wood used. It is good practice to lay a layer or two of roofing felt or sheathing paper between the laminated floor and hardwood wearing surface. Where decoration is desired ceilings may be plastered or sheathed.

An interesting type of warehouse construction was recently described in the Engineering News Record in which concrete columns and girders replaced cast-iron columns and steel girders provided for by the original plans. The floor construction consisted of wood joists carrying a plank floor and hardwood wearing surface. The girders and columns were concreted after the floor framing had been placed so that the timber was naturally exposed to contact with excessive moisture. If the timber was previously infected with wood-destroying fungi, which quite frequently occurs during transit or while in storage, such exposure would accelerate the development of decay at points of contact. It is obvious that this form of construction requires that all bearing surfaces and points of contact of timber, and also of the plank flooring should be at least brush treated with creosote oil, and if possible all the lumber, excepting the wearing surface, should be thoroughly impregnated.

Creosoting Lumber for Residential Construction

It is probably a radical innovation to recommend the use of creosote oil on lumber to be used in buildings intended for human habitation, but it is not proposed that such treatment shall be permitted to give offense or to create obstacles to the proper employment of other materials required by design or custom. Upon reflection it will be found that much lumber used in the ordinary dwelling, duplex flat, some apartment buildings and general type of work-

ingmen's and rural homes is subject to decay, and must be replaced after but comparatively few years of service. It is quite common to observe every spring, carpenters busy around porches, verandas, etc., replacing planks here, a stringer or post there, and so on until in time a goodly portion of the structure has been rebuilt. Repairs of this nature must be made rather frequently to back porches and rear stairs of two, three and four-story apartment buildings, particularly the type of open wooden construction common in the Middle West in which more or less non-durable species of wood and the cheaper grades of lumber are employed. It is in such places that the use of creosote oil is warranted and would

result in a considerable saving. Sills, plates, posts, ground floor girders and basement stringers or beams of frame dwellings and duplex flats, stringers of porches and rear stairs, also the edges and bottom sides of porch flooring should be given a preservative treatment.

Surface treatments are most practical for this purpose—namely, application of two paint coats of refined creosote oil to the points of contact, previous to erection. In the case of sills or plates which rest on the foundation, it will do no harm to so treat the entire stick, but where it is desired to apply light shades of oil paints, as on porches, the creosote must be applied only to the ends or covered surfaces as if brushed over the parts which it is subsequently desired to paint, the creosote will discolor the paint. Should, however, the preservative be accidentally spread beyond the area that it is intended to treat (which need not occur if the workman is reasonably careful), a coat of shellac applied over the creosote when dry will permit application of the paint without being discolored by the oil. Quite often it is desirable to stain exterior trim, porches, etc., a dark brown. In such cases refined creosote may be applied to all surfaces with satisfactory results, and at a considerable saving over the cost of oil paints or standard stains. Shingles may also be economically treated with creosote with pleasing effect if combined with a light colored house body. Wide rough siding painted with the same product may be employed for bungalows when relieved by white painted trim, window sashes and door frames. This phase is incidental, however, to the chief object, which is to retard decay of the wood at the most vulnerable points, namely, those totally or partially enclosed, or in contact, where moisture may be retained and the development of decay is advanced. The purpose is to increase the life of the ends of timbers to equal that of the balance of the stick as nearly as that is possible, with the method of treatment it is permissible to use, thus increasing the life of the entire structure and reducing the numerous repair bills.

Particular Advantage for Cheap Buildings

The use of creosote oil in the manner described is of particular advantage where numerous low-priced dwellings, such as whole groups of workingmen's homes, or suburban real estate projects are promoted and employment of cheaper lumber, or less durable species and grades, is desirable or necessary. Maximum service is obtainable if such material is protected from decay by preservative treatment, and the cost of painting can be materially reduced by the judicious substitution of refined creosote for high-priced paints and stains.

It may be possible to erect a treating tank on the site and to treat practically all the lumber used in the ground floor framing and porches; the shingles, back yard fence boards and fence posts, and extending the use of creosote even to the wash-line posts and pergolas. A careful consideration of these suggestions will indicate the possibility of a very considerable saving and the few objections that present themselves should readily be overcome.

Methods of Preservative Treatment

For general wooden construction, discussed in this article, the non-pressure processes are especially adapted and may be recommended with such limitations as have been mentioned. Service conditions

do not usually result in mechanical abrasion sufficient to make ineffective the treatment obtainable by the Open Tank Process, with the exception of factory and warehouse floors where creosoted blocks floor construction is, of course, the most serviceable. Where surface treatments have been suggested it is obviously impossible or impracticable to use either of the other two. No matter what the theory may be, the purpose of wood preservation is to conserve timber, increase the life and consequently the serviceability of the structure of which it is a part by some effective preservative treatment, and if the conditions are such as to preclude the use of the most efficient processes, one, though less efficient, but that it is practical, and possible to employ under the circumstances, achieves, at least partially, the object in view. This is the reason why surface treatments are used and are to be recommended in certain cases.

The Open Tank Process

The best results are obtained when species of wood are chosen which may be readily impregnated in this process, and as these are usually the less durable

kind, or of lower grade, but still of sufficient strength, they are also generally cheaper than the select grades which would be necessary if untreated wood were to be used. The resultant saving will occasionally cover the cost of creosoting. An instance of this nature recently was brought to the writer's attention. In a certain form of construction 1 inch by four inch tongue and groove lumber graded B & B was heretofore used, untreated, with an average life of six to seven years.

This cost $45 per M. ft. B. M. It was found that No. 3 grade when sorted cost about $25 per M. ft. B. M., and that if it were creosoted it would not only serve the purpose but last longer. The cost of a thorough treatment by the Open Tank Process equalled approximately $15 per M ft. B. M. Consequently in addition to an initial saving of over 10 per cent in material, the reduction of maintenance, due to creosoting, which in this case was considerable, resulted in a total saving estimated at nearly 100 per cent. This is probably an exceptional case, but is indicative of the possibilities.

The proper preparation of wood for treatment is probably more important than the treatment itself, the effectiveness of the latter depending largely upon whether or not the timber has been satisfactorily seasoned. It is difficult, if not impossible, to obtain satisfactory results in the treatment of green timber with the occasional exception of sap and loblolly pine, etc. If the wood cells are filled with moisture the creosote cannot penetrate unless the water is expelled by artificial means. This is accomplished either by steaming, as in the pressure processes, or by continuous soaking in the hot bath until the wood has been heated throughout to the temperature of the oil, which must be between 200° F. and 220° F. The former process is not available because it is impossible for contractors or industrials to equip themselves with the necessary apparatus for creosoting by the Pressure Process. The latter procedure requires more time than is usually practicable, thus eliminating it from consideration. Numerous cases have been observed where the attempt to treat practically green timber by short immersions in hot creosote oil resulted in failures for which the preservative and the method were held responsible.

Where it is absolutely necessary to use improperly seasoned timber, that is, the moisture content of which is greater than permissible for treatment by the Open Tank Process, and the Pressure Process is not available, the only means of protecting the timber somewhat is the Brush Method. This treatment is applied to all "faying" surfaces of timbers of wooden ships being built for the Government, which, as is well known, are practically green. The film of preservative is retained between the contact surfaces of the timbers and thus retards decay at these points. In a general report made to the Shipping Board it was stated that, "There are few places in the ship, however, where, with the expenditure of a little care greater returns on the investment can be expected than in preservative treatment."

Procedure of Treatment

The procedure in the Open Tank Process is as follows: After the lumber to be creosoted has been framed, bored and cut to size it is given the hot treatment, which consists of immersion in a bath of refined oil having a temperature of between 150° and 200° F., and this is continued for varying periods, depending upon the species of wood and the size of the timber. Immediately afterwards the timber is immersed in a cold bath of creosote, which is kept at a temperature not in excess of 100° F., for periods equal in duration to the hot bath. The theory of the Open Tank Process is that in the hot treatment the

heat of the preservative expands and expels a portion of the air and water contained in the wood cells. Upon immersion in the cold bath, or when subjected to a change in temperature caused by the cooling of the creosote, there is a partial contraction and condensation of the air and water that remains, which results in a slight vacuum within the wood. This vaccum is aided by atmospheric pressure, combined with capillary attraction between the wood cells and the preservative, which achieves the actual impregnation.

Experiments have shown that of the total absorption of creosote oil obtained in the Open Tank Process 25 to 30 per cent occurs in the hot bath and 70 to 75 per cent is absorbed by the wood in the cold bath. These results tend to prove the correctness of the theory above expressed.

Modifications to Meet Conditions

Modifications conforming to special requirements and local operating conditions are inevitable on all large jobs, and may be made without affecting the efficiency of the treatment. This is one of the most important advantages of the Open Tank System. Lumber of small cross section often can be effectively treated by immersion for short periods in the hot bath alone, especially when of a species not particularly resistant to impregnation. Heavy timbers are most economically treated by continuous immersion in one tank during the entire process. Upon the expiration of the hot treatment the timbers are not removed to a cold tank, but remain in the tank, the steam being shut off and the bath allowed to cool to atmospheric temperature. This usually requires from 8 to 12 hours, or from evening until the next morning.

Periods of Immersion

The following is a general rule, suggested merely as a guide, as in practice specifications must conform to the particular condition of the wood used in each case: Close grained woods, naturally resistant to injection of creosote oil, should be immersed for one hour in the hot bath and one hour in the cold bath for each of the largest dimension of the cross-section. Timber of species more easily treated require 15 minutes per inch in each bath, and lumber from fifteen to thirty minutes in each bath, although in many cases immersion in the hot bath only is sufficient for boards.

Then the cold bath is replaced by the cooling treatment, the oil treatment is continued for the periods stated and the cold treatment continues until the oil has cooled to atmospheric temperature.

Surface Treatments

These are (a) the Brush Treatment; (b) spraying; (c) dipping. The Brush treatment consists of applying two paint coats of creosote with an ordinary wide wire bound brush to all points of contact, previous to erection and to such other surfaces as it may be desirable to treat. Sometimes a mop is substituted for the brush, or the preservative is poured over the timber. Spraying is done with some standard spraying machine having a proper nozzle, and possesses the advantages of greater speed and a saving in labor.

It is claimed by many that spraying results in a much better treatment, as the oil is more apt to penetrate existing crevices in the wood. Dipping, or short immersions in the heated preservative, is a modification of the Open Tank Process when used for lumber of small dimensions which is easily treated. It is often employed for timbers when it is desired to apply a surface treatment to the entire stick without the necessity of double handling otherwise required by the Brush method. Whenever possible the oil should be heated to 150° Fahrenheit, although if that is inconvenient a properly refined liquid creosote oil may be used in its natural state when the atmospheric temperature is 65° or over.

In every instance all framing and drilling of bolt holes, etc., must be completed before the preservative is applied. After treatment the creosoted surfaces must present an unbroken film of oil. If the preservative coating has been injured or worn off, the value of the treatment has been destroyed.

Proper Creosote Essential

An important feature is the selection of the preservative to be used in non-pressure treatments. Pure coal-tar creosote oil, which conforms to standard specifications and is refined to meet the special requirements of non-pressure treatments is most efficient. Wood-tar creosote or adulterated coal-tar products are not permitted. In the case of exposed structures the preservative must be effective for many years and it is necessary that the product selected have a clear record as to its efficiency. An established standard now exists for non-pressure treatments—namely, specifications for refined creosote issued by the United States Shipping Board Emergency Fleet Corporation, recently adapted by the United States Railroad Administration, and an

(*Continued on page 739*)

The V-Notch Liquid Meter and Its Application to the Paper Industry

By L. G. CHASE

PAPER makers have many uses for liquid meters. Power costs are of the most vital importance to the manager of any large mill. Most managers figure pounds of coal against pounds of paper produced. In order to determine whether the steam used in the production of the paper is made in an economical manner, the water going to the boilers must be weighed and the evaporation checked. It is also very necessary to determine the correct amount of steam to be used for the proper drying of certain grades of paper. Usually an employee simply opens a steam valve and turns in enough steam to suit the given conditions, or at least, what he thinks is right. There is no reason why this cannot be worked out on a scientific basis. It is necessary only to install a properly designed liquid meter on the discharge side of the vacuum pump attached to the drying rolls in order to determine the exact amount of steam at any given pressure to dry properly any given weight of paper.

Another place where such a liquid meter can be used to good advantage is to measure the alkali returns from the digesters in the soda process, also the amount of fresh liquid required. It can be used to very good advantage to determine the correct amount of bleach for any given grade of product. The most important use of all is in the measurement of the wet stock going to the machine. If this wet stock is properly measured and the amount of water it contains known, a splendid check is obtained against the amount of product which the machine turns out and any losses taking place around the paper machine show up at once. In a number of cases large amounts of stock have been lost because there was not a proper check between the stock supplied to the machine and the actual paper taken off. These are the principal places where a suitable liquid meter is peculiarly adapted to the paper industry. There are many other special cases which are individual to the various mills.

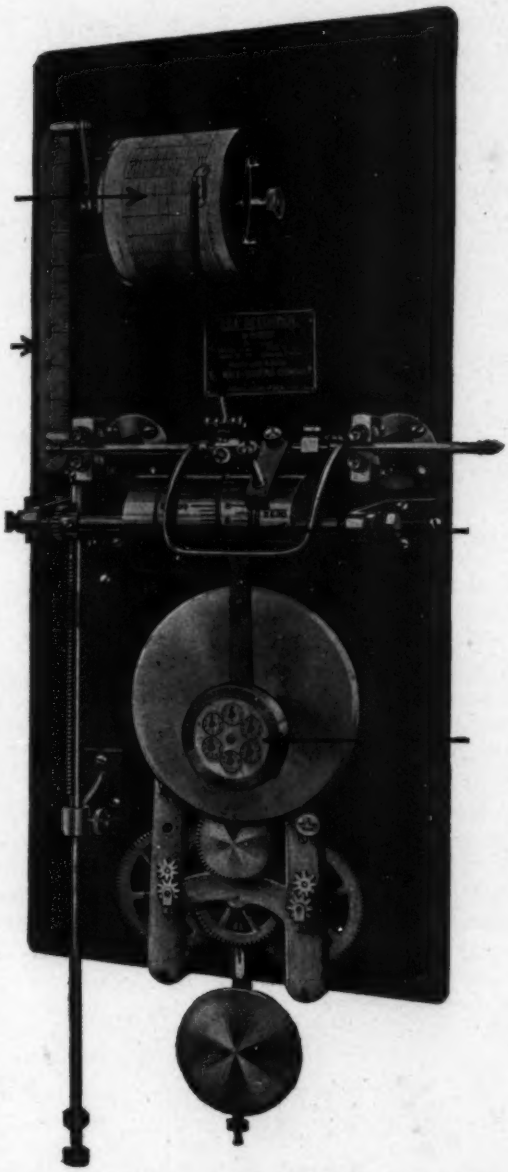
The various types of liquid meters for modern engineering practice, stand in two groups: Those which measure the flow in closed lines under pressure and those which do their measuring in open lines at or near atmospheric pressure. Among the former are, the velocity head meter whcih used Pitot tubes, flow nozzles, orifice tubes or plates; displacement meters; and the turbine or disc meter propelled by the velocity head. These types are affected seriously by sudden changes in the rate of flow which cause line surging and by impurities contained in the liquid which clog the Pitot tubes, strainers, and so forth. So the meters which do their measuring in closed lines under pressure are inaccurate unless they have very close and careful attention and the conditions under which they

work are adapted to their mechanical features. These types of meters have a large field in the measurement of steam, gas, air and water and except in cases where the element to be measured is a liquid are, of course, the only type that can be used. What type of meter is best for liquid measurement?

It has been found that the one best suited for such work is the weir meter, because the weir is not at all affected by the impurities contained in the liquids to be measured. Various types of weirs are in use, but due to the unchanging constant of the V-notch for any range of flow, this type of notch has become the standard for weir meters. The 90-degree V-notch has the simple formula Q .305 H H where Q is the water in cubic feet per minute and H is the height of the head over the weir in inches. The float, by means of which the measurement of the height of the flow is transferred to the recording mechanism, compensates for changes in temperature of the liquid and results are obtained guaranteed within one per cent of the actual weighed liquid. Over any given period a properly designed weir meter will be much more accurate than any human weighing agency.

Cut No. 1 shows a standard type meter and the method of assembly of the various parts which go to make up this instrument. Underneath the weir chamber in an extra storage chamber, a float which rises and falls on the surface of the liquid operates

a balanced inlet valve which automatically controls the flow of liquid through the meter according to the demand upon the meter. The large storage chamber



eliminates instantaneous changes in the rate of flow and sharp fluctuations of the recording mechanism. In other words, it smooths out the rate of flow. The small bay window shown on the side of the tank case is provided with a pointer set on a level with the exact apex of the V-notch and forms a convenient method of checking the meter at any time without taking off the coverplate.

Where this extra storage chamber is not desired, as in the measurement of water or other liquids going to a sump, a much simpler design can be provided.

The meter tanks can be made up in steel, wood, cast iron or other material necessary to prevent chemical action by the liquid to be measured. They are usually constructed to withstand a back pressure of three pounds, but a number have been built for use under fifteen to twenty pounds. The V-notch weir plate may be made of brass, monel, glass, hard rubber, or, in fact, any material which best resists the particular liquid being measured.

The recording mechanism is shown in cut No. 2. The float rises and falls with the varying height of the liquid passing over the weir. The float rod carries a pointer which gives the height of the liquid over the weir in inches at any instant. This float rod also carries a rack which revolves the cam drum by means of a pinion. This cam drum has a notch cut in it corresponding to the rate of flow. A follower connected to the slider bar works in the groove of the cam drum and moves the pen across the chart. The groove in the cam drum is so cut that equal distances of pen travel represent equal volumes of flow. This is the graphic record and the charts so formed give a record over any period up to twenty-four hours. An integrator is also provided so that the total volume for any period may be computed by subtracting the initial from the final reading. The entire meter is of a strong, sturdy construction, and the tank and all parts in contact with the liquid can be made of metal not affected by chemicals. This is the only meter of this type which has a positive transmission between the float and the recording mechanism.

Where it is desirable to have the recording mechanism in some position other than directly over the meter, a special float chamber can be used and connection so made that the recording instrument can be placed on the floor above, on the floor beneath or at a short distance to one side of the meter proper.

Preservation of Timber

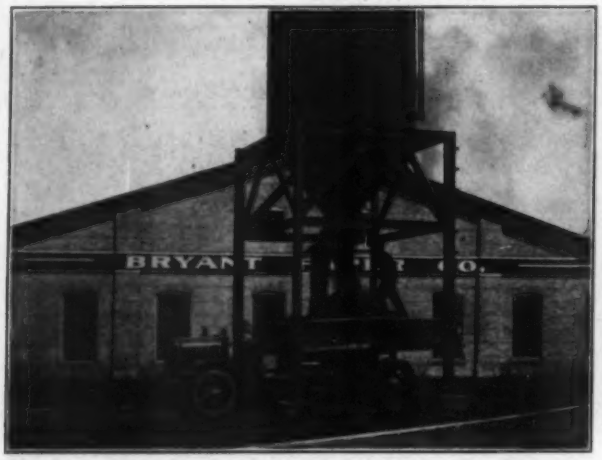
(*Continued from page 737*)

oil meeting these requirements assures success with non-pressure treatments.

In considering the suggestions made in this article it should be noted that refined creosote oil is particularly referred to, and it must also be borne in mind that the physical character thereof differs from that of the commercial grades in that the process of refinement has removed the lower boiling fractions, which because of their volatility, i. e., tendency to evaporate when heated and even after treatment, and to solidify when exposed to low temperatures, cause the commercial creosote oils to be ill-adapted for employment by the average consumer in non-pressure processes of treatment and may even become objectionable for the purposes discussed.

Mechanical Coal and Ash Equipment

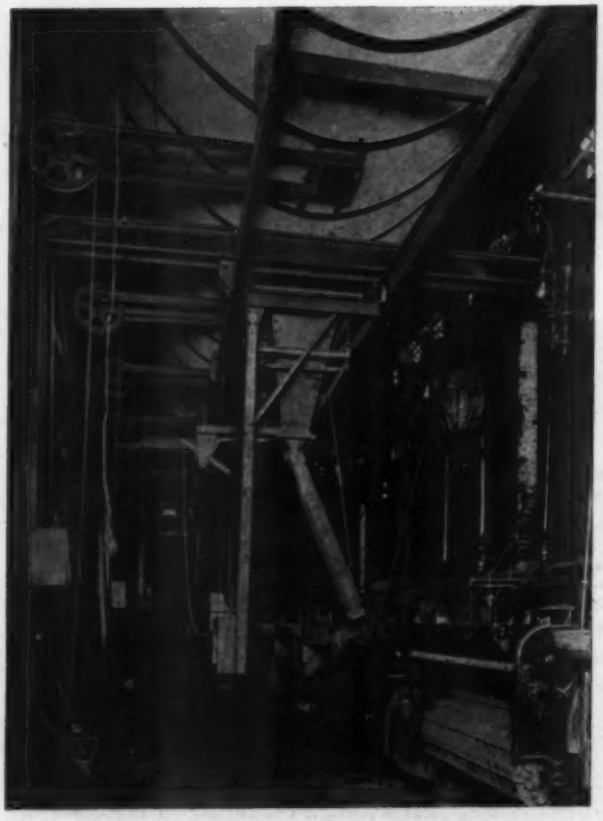
A few worth while suggestions for taking care of your labor problem in its relation to Coal and Ashes



How the Bryant Paper Co. remove their ashes

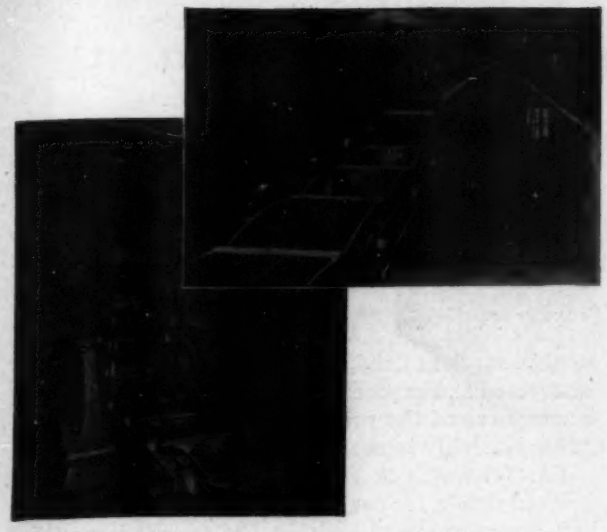
This contrivance will put quite a few hand shovels out of business

Coal handling is light work when you have a crane on the job

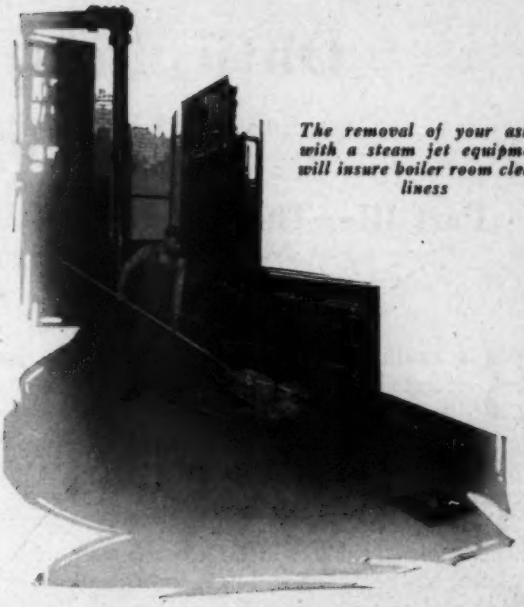


A box board mill's installation of concrete coal bunkers with weighing attachment

The lower run of a conveyor installation for removing ashes



Bucket carriers to deliver the coal to overhead bunkers are a necessity in some power plants



The removal of your ashes with a steam jet equipment will insure boiler room cleanliness

A motor truck to handle your ashes will increase the value of your real estate holdings in the vicinity of the mill

The Watervleit Paper Co. tackle their coal problem with this equipment

A Coal Conveyor installation with Automatic Reversing Tripp ers which automatically fills bins and other storage spaces with a minimum of labor

Difficulties Encountered in Printing Papers

Part III—The Shrink and Stretch of Paper in Color Printing

By PETER J. MASSEY

(*Continued from November number*)

BY having one man in charge of each set of forms it will be much easier for the foreman to have full control of the work, as it will assure him that the bearers, grippers, guides, make-ready, delivery and color on the various units will be treated uniformly.

If the bearers are not set at the proper height considerable trouble will be experienced with the register, as the plates will have a tendency to "walk off" the press, and necessitate continuous tightening and shifting in the attempt to maintain register. The consequence will be a poorly printed job and a kick to the paper maker that his paper stretched excessively and prevented the printer from obtaining perfect register.

If the grippers are not set properly the sheet will be given an opportunity to pull out sufficiently to make considerable variation in register, which may or may not be blamed on the paper according to whether the foreman was or was not able to detect the real trouble.

Protection from Atmospheric Changes

During the printing operations the work is trayed and stacked. To each stack of trays is attached a tag with the press symbol, date and number in the consecutive order in which it was printed. This eliminates any possibility for error in choosing the wrong stacks when the subsequent impressions are being printed.

The trays are then covered with tarpaulins, oilcloth, or some other waterproof material, in order to keep the printed sheets from being affected through coming in direct contact with any sudden changes in the relative humidity of the pressroom.

These precautions assist materially in producing a uniformly printed product, and considerably reduce the troubles from imperfect register, as they have a tendency to stabilize conditions. Having the paper subjected to the action of the air in the pressroom for shortest possible uniform time intervals between each impression, prevents the sheet from being affected to any noticeable extent in the register. That these precautions are of material assistance has often been proven when they have been disregarded. Whenever the paper for the second or third impression was taken indiscriminately from the most convenient stack at hand, or when these stacks were left uncovered and exposed to the action of the changing atmosphere of the pressroom, it invariably resulted in considerably increasing the register difficulties.

Careful watch in the consecutive rotation of the printed sheets for each impression, during the printing operations, and keeping the trays covered between each impression, limits the time in which the paper can be affected by any changes in atmospheric conditions to about one hour for each impression, and is not of sufficient duration to make any noticeable change in register, except when abnormal conditions prevail.

Time Interval Between Impressions

To achieve the best results in process or other color work the impressions should follow one another as closely as possible, with a twenty-four hour interval as the maximum. It is for this reason that more complaints on "shrink and stretch" are received by the paper men from printers having a small pressroom, or from a large pressroom that does not have sufficient units available to maintain this short interval between impressions. In the small shop the work is left lay around the pressroom, under variable atmospheric conditions, for a comparatively long period of time, without any protection whatever from the changes in relative humidity, with the consequence that considerable "shrink and stretch" takes place between impressions, and the edges of the paper become so curled that no two sheets can be placed down to the gripper guides accurate enough to give them the same gripper hold. It is therefore impossible to obtain perfect register under these conditions, and should not be expected from any paper.

The disregard of proper time intervals between impressions is also the cause of considerable ink trouble. To achieve the best results in process or other color work the impressions should follow one another as soon as possible after the color on the preceding impression has "set" sufficiently for the work to be handled without offsetting and smearing. Should the ink be allowed to dry by absorption or oxidation the ink film will be too hard for the next impression to "take" properly. To prevent the ink from drying the pressman in a plant having insuffi-

Power Plant Wastes

By F. F. VATER

THE following suggestions are not made in a spirit of criticism but rather in the hope that your attention may be called to a source of loss that can easily be remedied.

One is prone to overlook wastes because the plant is apparently running well. It is the invisible, insidious waste that costs material sums in the long run.

Vacuum Pumps and Feed Water Heaters

The vacuum pump usually found in not only paper mills but in other plants having heating and drying systems may be a source of material loss.

As a rule the type of pump used will not create a vacuum because of the high temperature of the condensation it handles.

Some vacuum, eight or ten inches, being necessary, a jet of cold water is piped into the suction side of the vacuum pump. This jet water cools the condensation; the mixture being pumped into the feed water heater.

The jetting of any cold water into the condensation should be avoided because of the possibility of serious loss.

First: As long as no more water is passed through the jet than is necessary to provide enough make up water no heat loss is occurring. Very often an excessive amount of jet water is used. Consequently the feedwater heater is overflowing constantly.

In one plant visited recently the temperature of the water at the boiler feed pumps was 170 degrees F. A back pressure of 3½ pounds was carried on the feed water heater which was a standard make and capable of delivering water within 5 degrees F. as hot as the steam. By turning to a table of the properties of saturated steam you will find the temperature at 3½ pounds gauge pressure (18.2 pounds absolute pressure) to be $225\frac{3}{10}$ degrees F.

The heater being capable of delivering water at 5 degrees F. less temperature or $220\frac{3}{10}$ F. the B. T. U. loss was 50.3 for every pound of water pumped into the boilers.

In this particular plant this waste caused a decrease in net earnings of $3,123 per annum.

This heavy loss was caused by getting an excessive amount of jet water into the vacuum pumps.

The hot condensation was flowing to the sewer through the overflow connection of the feed water heater.

Why are feed water heaters so piped that this overflowing can occur without any evidence?

Invariably the overflow connections are closed and lead to the sewer.

If this connection was open so that the overflow water was discharged on to the floor it would have been stopped.

If a regulating valve on a heater sticks it will cause it to overflow and when there is any overflow some condition is wrong and the loss should be stopped at once.

Another Source of Loss from Jetting Cold Water into a Vacuum Pump

Every plant owner is endeavoring to save coal and save boiler repairs. At current prices he is compelled to do so.

One serious source of heat loss and boiler repairs is caused by scale on the boiler heating surfaces. Now, condensation is free from scale. Jet water is just as hard as your water supply, therefore, every gallon of raw water jetted into a vacuum pump is putting that much scale making matter into your boilers, increasing your coal bill and eventually causing the tubes to burn.

An urgent suggestion then is—Don't buy a vacuum pump that will not operate without a cold water jet.

Do you **know** that the conditions existing in the plant just mentioned are not occurring in **your** plant? Find out.

Save Your Exhaust Steam

Another source of waste consists in not using your exhaust steam.

Every pound of exhaust at atmospheric pressure contains 965.7 B. T. U. This is the latent heat of evaporation.

Raise a given quantity of water to 212 degrees F. It is still water. In order to change this water from a liquid to a gaseous form you will have to put into it 965.7 B. T. U. per pound.

When you exhaust one pound to the atmosphere you are wasting the latent heat of evaporation which has cost coal.

If any steam around your plant is going to the atmosphere something or several things are wrong. You should not have more than enough exhaust to heat your boiler feed water above that required for mill heating and the driers.

A well balanced plant wastes no exhaust. Jet condense a small engine and use the hot well water in your washers. Replace a steam heating pump with an efficient one. It will pay you.

Small Leaks

It is the little things that count. They need watching. A thousand pounds of steam is costing about 50 cents to produce. See that the valve stems on your

(*Continued on page 746*)

The Value of Waste Paper Stock in the Manufacture of New Book Papers

By EDWARD T. A. COUGHLIN, B.S., CH., E.

Open Tank Cooking Process for Old Papers

THE recovery of the alkaline cooking liquor used in this open tank process is perhaps the greatest point in favor of this method of cooking old waste papers. The fact that no additional care, expense, or trouble is consumed in effecting this recovery is also an attractive feature.

In hoisting or raising the cooked papers on the false bottom, the ascent of the papers is very slow, usually taking about 30 minutes to raise ten feet. This is only a raise of four inches per minute and is so slow that most all of the liquor that is not absorbed by the papers finds its way to the remaining liquor in the tank. By this slow draining and running off of the liquor a varying per cent of the liquor is saved. The variation is caused by the nature of

View of Cooking Tank after Papers are removed.

the papers themselves, the soft porous papers acting like a spongy mass in retaining more liquor than the hard sized stiff rag stock papers. Another cause for the variation is due to the fact that considerable liquor is lost by splashing over the side of the tank while spraying with too great pressure of steam. Also in the raising of the papers the liquor continues to ooze out of the sides and drains down to the rim of the top of the tank. If there is no opening for the liquor to return to the tank, it will of course run over the sides and be lost in the drain to the sewer. With these losses, however, the average daily recovery is 66.66 per cent of the volume of liquor used. At times the recovery has been as low as 24 per cent and even has reached the high figure of 92 per cent.

The following table of figures was tabulated from exact data to show the variation in the percentage recovery of liquor that will occur from day to day under ordinary conditions.

OPEN TANK COOKING PROCESS

Recovery of Soda Ash Liquor from "Bleach" Tanks for October, 1915

Date	Per cent						
	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
1	66.7	77.8	75.9	63.0	74.1	72.2	74.1
2	81.5	72.2	81.5	74.1	74.1	...	...
4	New	85.2	74.1	61.1	79.6	...	...
5	64.8	88.9	85.2	66.7	64.8	66.7	...
6	74.1	72.2	70.4	70.4	66.7	...	...
7	55.6	81.5	74.1	68.5	66.7	...	...
8	66.7	75.9	74.1	72.2	66.7	...	...
9	72.2	72.2	83.3	85.2	66.7	...	...
11	81.5	79.6	87.0	68.5	New	...	...
12	68.5	72.2	79.6	63.0	70.4	...	...
13	77.8	81.5	74.1	55.6	63.0	...	...
14	61.1	68.5	77.8	74.1	70.4	...	...
15	66.7	72.2	74.1	66.7	63.0	...	...
16	64.8	74.1	70.4	48.2	33.4	...	...
18	70.4	New	87.0	74.1	66.7	...	...
19	75.9	66.7	77.8	77.8	66.7	70.4	70.4
20	55.6	75.9	77.8	48.2	64.8	...	...
21	72.2	79.6	77.8	70.4	83.3	68.5	74.1
22	55.6	66.7	75.9	53.7	48.2	77.8	70.4
23	55.6	83.3	85.2	66.7	51.9	66.7	79.6
25	74.1	87.0	75.9	64.8	68.5	72.2	79.6
26	63.0	72.2	79.6	79.6	79.6	72.2	70.4
27	75.9	74.1	75.9	48.2	55.6	...	...
28	75.9	75.9	77.8	79.6	68.5	74.1	85.2
29	53.7	75.9	70.4	40.8	68.5	72.2	77.8
30	48.2	74.1	85.2	74.1	48.2	...	...
Average	67.00	76.21	78.03	66.00	65.18	71.3	75.73

Total average for month on all tanks, 71.34 per cent, with 146 cooks.

In this tabulation, which is perhaps the best series of results so far obtained, the variation is quite evident. The lowest figure is 33 per cent, while the highest is 89 per cent. At first it was thought that this high recovery did not actually represent the same value as the corresponding volume or per cent of new liquor. It was claimed that from 20 to 30 per cent of the alkali content was consumed in the saponification of the ink, colors and sizings, and that the condensation of the steam caused the increase in the volume of the liquor.

It is true that there is some decrease in the strength of the alkali content of the liquor due to

this saponification action. To ascertain the extent of this decrease a series of analyses have been undertaken and the results will be discussed in detail later. As to the increase in volume of the liquor from the steam condensing, I contend that this is not as great as it is supposed generally. There is considerable condensation while the liquor is being raised to the boiling point, but after that the steam acts only as the projecting force to spray the liquor. The volume of steam and vapor given off on spraying is surely equal to the amount of steam injected into the tank. It is also possible and very probable that a great deal of the liquor at this temperature is vaporized and carried off mechanically with the upward rush of projecting steam and liquor. This being the case the volume of liquor would not be increased to any very great degree by the condensed steam; and, on the other hand, the volume may be diminished and the liquor concentrated. This point we will determine closely on consulting the analytical conclusions.

A very interesting summary of the average daily recoveries for each tank for a number of months has been tabulated. It is as follows:

Summary of Average Daily Recovery of Liquor

OPEN TANK COOKING PROCESS
Summary of Average Daily Recovery of Liquor
1915

	Per cent								
Months	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	All Tanks	No. Cooks
April	65.18	64.16	68.93	57.52	66.07	68.56	....	65.07	147
May	55.55	62.22	65.65	53.48	65.36	51.85	....	59.02	143
June	57.57	69.38	66.58	53.99	61.06	63.96	64.04	67.37	154
July	59.07	70.18	71.44	60.63	60.30	63.90	57.40	63.27	89
August	60.01	75.01	71.20	65.17	67.05	62.50	....	66.82	122
September ..	60.17	73.33	73.01	65.35	70.58	68.26	71.40	70.64	152
October	67.00	76.21	78.03	66.00	65.18	71.30	75.23	71.37	146

A peculiar difference occurs from month to month in these figures. In the late spring and summer months the recovery is low and increases in the fall and winter months. This may be attributed to the difference in the humidity of the air in these different seasons. In the spring and summer the air is dry and the circulating winds and breezes absorb and take up any moisture present in the cooking room, whereas during the other seasons the moisture in the circulating air is greater and the ventilation less complete, or possibly a greater condensation.

As stated above there is a loss of liquor in spraying over the tanks, and in the liquor that oozes from the sides of the papers while being raised which fails to return to the tank. There is a further loss in the liquor that drains away while the cars are standing in storage. All of this liquor which now goes to the sewer could be very easily saved and recovered with a very little expenditure of money. With a concrete floor with grooved drains made in it all of this liquor could be conducted to one catch-all tank. A catch-pan in the form of an elbow could be riveted to the upper rim of the tank, into which would drain all of the liquor which ordinarily goes to waste when the papers are raised.

The percentage of the alkali recovered would be further increased if the papers could be washed once or twice with warm water while they still remained in the cooking tank. This would necessitate the draining off of the liquor from the tanks before adding the wash water. The strong liquor should be stored separate and the wash water by itself in another tank. By this arrangement with a little care and attention the strength of the liquors in all of the tanks would be the same. The strength of the recovered liquor could be determined, and its volume readily determined. Then by utilizing the wash water for dissolving the correct amount of soda ash and adding to the strong liquor the strength and volume of the whole could be brought up to the standard strength for cooking.

View of the conveyor belt sorting system

Power Plant Wastes

(*Continued from Page 743*)

pressure lines are well packed. If you are carrying 150 to 165 pounds pressure you can blow a thousand pounds of steam through a leaky valve stem in an hour or two.

Watch your boiler blow-off valves. If they leak any buy a new one.

If you don't know how many pounds of coal it requires to make a ton of paper have a test run and find out.

Having this record once and comparing the ratio frequently will aid you in keeping the cost down.

Don't take hot water for the radiator of your automobile from the heating system and have a three-quarters-inch connection from the coil open to the atmosphere. You can't maintain a vacuum under this condition.

Your drainage will be unsatisfactory and your vacuum pump, in its effort to do its duty, will soon wear out.

You can hardly believe anyone would do a trick like that but they do.

That New Power Plant

If you contemplate building a new power plant for your present mill or are going to build a new mill that will require a power plant be careful.

Don't copy the methods used in designing a central station generating power.

Your load is practically uniform. The central station is a peak load proposition and what would be good practice for peak loads would be folly for you.

It is a well known fact that any well designed boiler will evaporate more water per pound of coal when operating at 125 to 130 per cent of rating than it will on lower or higher loads.

If you design your boiler plant to operate at 175 or 200 per cent of rating having as you do a steady load your coal per ton of paper will be wastefully high.

I question the economy of high steam pressures. I mean by high, 200 pounds or more. This should be decided from a commercial standpoint. If you save a few pounds of steam per K.W. hour be sure that it will not cost you more than you save to get it.

Your boiler cost is much higher, your piping and auxiliary costs are greater and the depreciation is very high.

If your first cost is $30,000 greater bear in mind that your interest and depreciation at 16 per cent amounts to $4,800 a year and remember too that high pressures mean higher priced men and a greater maintenance charge.

Extremes are dangerous. Keep to the middle of the road.

Difficulties Encountered in Printing Papers

(*Continued from Page 742*)

cient equipment adds to it a non-drying compound in proportion to the length of time that he guesses will elapse before the next color will be printed. If the pressman happens to be a good guesser, or if the work happens to go through on scheduled time without delay, the job will be O. K. If he's a poor guesser the job will be N. G. In the case of a long guess on a job where coated paper is being used the paper maker is going to have a complaint on his hands that the stock is unevenly coated. To all outward appearances the printer will be fully justified in his complaint, as the printing will have a pockmarked appearance, the ink being dry in spots and not in others. But the real cause of the trouble is that too much compound was added to retard the drying. This has allowed the high lights and second shades, where there was a very light film of ink, to dry, but has prevented the chain tones and solids with their heavier film from becoming fully "set." The result is a smeared offset and spotty printed sheet, not because the paper was unevenly coated, but because the overabundance of compound caused the ink on the heavier portions of the form to "set" in spots and stay "wet" in others. Where the guess was on the short side, the ink manufacturer is called upon to do some explaining as to why his ink has "crystallized." The printer who bites off more than he can chew on his equipment very often places the responsibility of the poorly printed job on to the paper maker. This is not only an injustice to the paper maker, but to the printer who knows his business and who is trying to co-operate in the production of a better printed sheet.

All the precautionary measures that have been adopted by the progressive printers for handling the paper before and during the printing operation to prevent "shrink and stretch" have undoubtedly given very material assistance in alleviating the difficulties that are encountered in registering several superimposed colors, but they are all practically useless when extreme conditions of relative humidity prevail in the pressroom. In some instances many of the large representative color houses have been obliged to shut down their whole plant on account of excessive humidity. The cure, then, must be sought through some other means than proper methods of handling and storing the paper.

(*Concluded in January number*)

The Application of Oil Fuel to Steam Boiler

W. A. Darrah
Vice-Pres. Continental Industrial Engineers, Inc.

A CONSIDERATION of fuels for steam generation becomes of fundamental importance with rapidly mounting costs and uncertainties surrounding the production and transportation of coal.

Early attempts at the economical utilization of fuel oil under boilers were often crude, and recognized engineering principles were often neglected. As a result, the full benefits of oil fuel for this application were not appreciated.

The object of this paper is to point out some of the factors which make oil an economical, convenient, and satisfactory boiler fuel, even in competition with relatively low priced coal.

Requirements

Experience shows that there are certain essential requirements which any fuel must meet in order to give satisfactory performance under a steam boiler. Many of these requirements are equal in importance to the factor of economy which is usually given main consideration.

In the application of fuel oil to boiler practice, it is not sufficient to compare the cost of the heat purchased in the coal with that of heat purchased in the fuel oil. Additional items which should be considered may be summarized as follows:

Flexibility
Quick response to steam demand
Absence of smoke
Labor charge
Investment charge
Boiler capacity
Economy

Flexibility

Any fuel or system of burning fuel, to give satisfaction under a steam boiler must permit of a wide range of efficient operation. In other words, since the steam demand on most boilers fluctuates widely, a combustion system, to be satisfactory, must have a reasonable efficiency while the boilers are idling, and a high efficiency at normal load or overload.

Response to Steam Demand

In the practical operation of power systems the electrical or mechanical load is, in most cases, rapidly fluctuating. There will be intervals during which the steam demand will be very small, and such periods are frequently followed by intervals where the demand for steam is excessive. To successfully meet this condition a fuel must be adaptable to rapid changes from small consumption to very rapid consumption. Oil fuel obviously meets this condition better than almost any other fuel, since merely turning the valve increases at will the oil consumption.

Combustion

The subject of combustion is very closely linked up with the subject of overall efficiency. It will be obvious, however, that in securing complete and economical combustion, smoke will be eliminated, boiler capacity increased, and economy improved.

The oil combustion system marketed by the General Combustion Co. is ideally suited to secure nearly perfect combustion because of the excellent mixture of fuel and air in the proper proportions. This system, therefore, results in an absence of smoke.

Labor Charge

It will be obvious that an oil fuel which may be readily conveyed in pipes from the storage tank to the place at which it is consumed, eliminates practically all labor for fuel handling, except that of a supervisory nature. There will, therefore, be no coal to handle, no ashes to remove, no fires to clean, and no complicated machinery, such as stokers, conveyors, etc., to maintain. It should be noted, also, that labor difficulties are correspondingly decreased.

Investment Charge

The installation of a fuel oil burning system reduces the number of boilers required (or the size of the boiler) and eliminates such investments as stokers, coal bunkers, coal and ash tracks, etc. Such a system also allows of the installation of the storage tank at any desired location, thus sometimes obviating either expensive structures or the purchase of real estate.

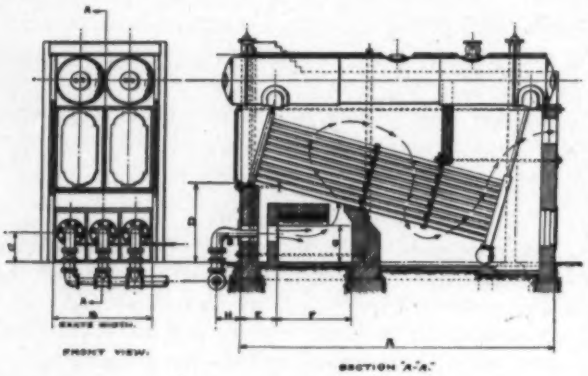
Boiler Capacity

It is a matter of common engineering knowledge that the capacity of a boiler is dependent mainly upon the fuel consuming ability of the grate and equipment. This figure is limited in the case of solid fuels by the great area and draft, by atmospheric conditions, by quality of the coal, necessity for cleaning, etc.

Practically all of the above limitations are removed by use of fuel oil, in which case the output of a boiler is limited only by its capacity to absorb heat and produce steam. By removing the limitations which fix the consumption of solid fuel, it is a matter of

actual experience that steam production may be more than doubled from any given boiler.

In old installations, design, boiler condition, and other factors may make it undesirable to exceed the boiler rating by more than 100 or 150 per cent. Such an increase, however, is almost always possible, and it will be noted that this factor reduces the investment charge by increasing the output of a given installation.



Efficiency

An analysis of conditions surrounding boiler efficiency involves the consideration of many details. Without taking time to examine these fully, they may be briefly summarized as follows:

1. Stack losses from gases which leave at about 600 degrees F. With the system of fuel oil consumption employed by the General Combustion Co., it is feasible to reduce the temperature of the exhaust gases to such an extent that a 7 per cent fuel saving is possible. The use of an air blast of 8 ounces pressure contributes to this effect.

2. Excess air necessary with solid fuel is about 50 per cent minimum. Under the above mentioned combustion system, fuel oil may be consumed with practically 100 per cent of air, and still secure perfect combustion.

3. The leakage of air through brick work and other places, due to the reduced pressure in the combustion chamber, in the case of solid fuel, causes a loss of 1 or 2 per cent of the total heat. The use of the pressure system in this case of oil fuel entirely eliminates this factor.

4. The loss from unburned fuel, which almost always exceeds 1 per cent with the best practice and frequently reaches 8 per cent, is entirely eliminated by using an effective system of oil combustion.

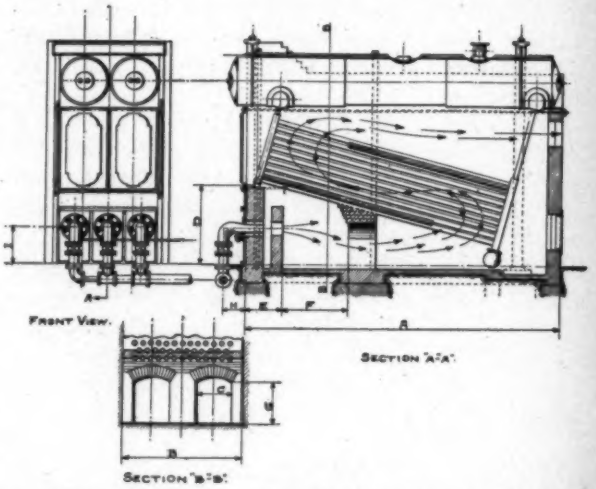
5. It will be obvious that the standby losses are very materially reduced by the utilization of oil fuel, while in the case of coal this factor becomes a serious item. The long period for which it is necessary to keep coal burning while shutting down or starting up the boilers makes this point evident.

6. The expense and losses of cleaning fires, slicing, opening doors for firing, and similar operations, are entirely eliminated with oil fuel, making a saving which ranges from 2 to 6 per cent, depending on operating conditions.

A consideration of the above facts will make it evident that in utilizing oil fuel by a successful system, the operating efficiency may be increased by as much as 20 per cent of the theoretical.

The United States Shipping Board have recently published figures showing the comparative performance of two sister ships on the same run, one equipped with oil fuel and the other burning coal. On the basis of figures published by this board, the saving in time amounted to practically three days, the saving in labor to the wages of six firemen, the saving in cargo space to the equivalent of 700 tons, and a net overall saving in dollars of $36,105 per trip.

Our own data indicates that from 100 to 120 gallons of oil is the equivalent to one ton of standard fuel coal. This affords a basis upon which relative operating costs can be calculated, but the writer wishes to emphasize that the associated savings and conveniences are frequently of more importance than the actual fuel economy, although in most cases this will be very appreciable.



Attached hereto is sketch No. 140 and No. 123 showing typical application of the General Combustion Co. "Oilgas" system to a boiler. It should be noted that no steam or high pressure air is employed, a blower supplying 8 ounces of pressure and 25 cubic feet of air per minute per gallon of oil burned per hour, is the only auxiliary equipment.

The Corliss Engine in Paper Mills

By G. H. Varley

IF there is one industry that, by its very nature, satisfactorily settles its first and biggest power problem, it is the paper industry.

Even to the most elementary mind it is conclusive that a plant which has such extensive use for steam, other than that of driving the machinery, must choose the steam engine as the initial power producer.

Automatically, this great auxiliary need for steam eliminates the serious consideration of any other kind of power.

Accepting this as a broad, general principle, the question resolves itself into the kind and number of steam engines and the methods of applying the power to obtain the greatest efficiency and economy.

Practically every installation is individual. It has conditions peculiar to itself in addition to those that affect all paper mills. It would be futile, therefore, to attempt to lay down positive detailed rules for the purchase of power equipment for any particular case, but we can discuss the fundamentals which no special conditions can affect materially.

The steam required for general manufacturing purposes in a paper mill demands a certain boiler capacity. Assuming that it is necessary to generate steam at 15 pounds pressure for this task, there will be a definite consumption of fuel to provide the heat. Using the same boilers with approximately 20 per cent more coal would generate steam at 125 pounds pressure which would be more than ample for all power requirements in addition to general manufacturing needs.

As the steam passes through the engine and is converted into power, its initial pressure and heat is reduced, yet this exhaust steam is just as valuable for heating purposes as live steam taken directly from the boilers. The heat lost is equivalent to the expansion of the steam; the latent heat is retained to be used, granting of course that the engine is run non-condensing.

Under these conditions a steam engine simply acts as a reducing valve for the steam—the power being of secondary consideration.

There is another prime factor for the use of a steam engine in a paper mill. The manufacture of paper generally is a continuous operation running from Monday morning to Saturday night. Any interruption of this service would be doubly costly. The actual time—and paper—would be lost from production and it would be compulsory to clean out the entire paper-making machine from the Fordrinier through the dryer to the finished roll and start the sheet through anew.

The steady day-in day-out service given by a steam engine, the slight chance of trouble developing so quickly as to necessitate a shutdown for repairs, in themselves are powerful arguments. Again, the considerable variation in the load due to operating conditions demand a power producer of great flexibility. The steam engine readily adapts itself to fluctuating loads and absorbs the consequent strains and stresses while keeping the machinery moving at a definite, pre-determined rate.

There are three well-defined divisions in the application of power in a paper mill. The paper making machine runs at a variable speed which may have such wide differences as the ratio from one to six. In contrast to this, the beaters, Jordans, stuff chests and pumps, with other miscellaneous machinery, can be run at a constant speed. The light and electrical energy for operating elevators, etc., is the third.

From this it would appear that the use of three power units is ideal—one engine with a variable speed device connected with the governor to drive the paper machine, one to drive all auxiliary machinery and another to drive an electric generator for providing electric energy for elevators or similar devices. In many paper plants, all machinery except the paper machine is driven by individual motors or is grouped for motor drive from power furnished by a generator driven by the steam engine. This arrangement is good where the power plant of the mill is centrally located and would demand much equipment, belts, ropes, line shafting, etc., to transmit the power from the engine room to the various machines.

The Corliss reciprocating engine has proved its value in the paper industry over a long period of years. The design and construction of the engine, the valve gears and operating mechanism are exceedingly simple and so universally known that a minute, technical description is unnecessary here. The name "Corliss" is synonymous with "reliability" in a steam engine. Any engineer can understand it thoroughly. At the comparatively low rotative speed demanded from a paper mill engine, the wear and tear on a Corliss engine properly lubricated is negligible.

Should some accident damage any part of a Corliss engine, it can speedily be repaired or replaced.

The greatest argument for Corliss Engines in paper mills, is the fact, that, in spite of experiments with other power producers, actual practice has demonstrated that their sure, steady reliability is enough to justify them—not considering their proved economy and operating efficiency under paper mill conditions.

Care and Management of Commutators and Brushes on Direct-Current Machinery

By JOHN A. RANDOLPH

Westinghouse Electric and Manufacturing Company

THE commutator, with its brushes, can be said to comprise the business end of a direct-current machine. It is the key to the situation, the clearing house through which power either enters or leaves. It is here that the greatest wear takes place and that the consequences of negligence are most quickly manifest. As the indisposition of the executive head of an organization affects the activities of that body, so a commutator out of condition decreases the efficiency of an electrical machine, and the detriment will increase the longer it is allowed to continue without remedy.

The commutator demands definite and regular attention. It should be kept clean by wiping at frequent intervals, preferably with canvas. Cloth that contains lint should not be used inasmuch as the lint is likely to catch under the brushes or stick between segments, thereby causing sparking. Paraffine may be applied for lubrication, but it should be used sparingly. No other attention is necessary for a commutator that is taking on a polish, shows no signs of wear and isn't sparking.

To Obtain a Smooth Surface

However, should indications of roughness appear, grinding is necessary in order to secure smoothness. In cases where the roughness is only slight, sandpaper applied to the revolving commutator by a small wooden block will generally suffice to accomplish the desired result. Coarse sandpaper should be used at first and then be followed by a finer grade for the final polish.

However, where the condition is such that the sandpaper is slow or impractical as a remedy, a sandstone should be used for the initial cutting down and then be followed by the fine sandpaper polish. Sandstones are particularly desirable in connection with large commutators such as those on generators or rotary converters. While grinding, the brushes should be lifted from the commutator if the armature can be revolved independently of the direct-current service. If it is necessary to leave the brushes down, extreme care should be observed in preventing a clogging of the brushes by the dust, with consequent sparking. The dust should be blown away at frequent intervals.

If the mica between the segments is meant to be flush, it should be kept so. If holes appear in the mica, they should be cleaned thoroughly and then filled with a dependable filler. Dental cement is perhaps as effective for this purpose as anything to be had at the present time.

Proper attention to a commutator will save the expenditure of time and material that inevitably results from negligence.

The Brushes

The commutator brushes of a direct-current machine are similar in function to the contact shoes on an electric train, which takes its power from a third rail. They serve as a medium for the transfer of power to or from a moving conductor. The elements of motion and wear introduce considerations that do not exist in stationary connections. For that reason they require care and attention.

The brushes should at all times bear evenly on the commutator, with their full contact surfaces touching. Should they be found to be badly pitted, scored, or making only partial contact with the commutator, they should be sandpapered down to a smooth, even surface. This should be done with the sandpaper held tightly against the commutator and the brush bearing down against it. The sandpaper should be drawn under the brush in the direction of rotation as many times as may be necessary to accomplish the desired result.

Occasional cleaning of brushes and holders is imperative to prevent sticking of the brushes in their boxes. Should the free movement of the brush be retarded, it cannot automatically compensate for wear, with the result that sparking and poor commutation is likely to result.

Brush Replacement

All brushes should bear with equal tension on the commutator to prevent unequal distribution of the current. Care should also be taken to replace brushes that become too short. The usefulness of a brush is ended when it becomes so short that its spring rests upon the holder, and it can no longer be made to make firm contact with the commutator. New brushes should always be examined to see if their running surfaces make good contact. If they do not they should be sandpapered to a fit.

In the case of brushes that have a metallic coating the metal should never be allowed to touch the commutator, but should be scraped back and not allowed to extend below the brush-holder box.

With proper care reliable brushes under normal conditions will give little trouble.

Proceedings of the American Pulp and Paper Mill Superintendents' Association Meeting on November 6-7, 1919, at the Congress Hotel, Chicago

Friday Morning Session, November 7, 1919, at 10 O'clock A. M. President Fred C. Boyce, Presiding

The President: Gentlemen, there is one thing about gatherings of this kind that I could never understand, and that is why a body of grown men who have gathered together from all parts of the country to hear some important addresses, will always get far away from what they came expressly to hear, by taking the seats that are in the rear of the hall. I am sure if you gentlemen who have taken the last rows of seats will kindly come up closer to the speaker you will be able to hear much better. Our program for today is an important one for you papermakers, as every one of the subjects to be discussed today is of vital importance to you all, and as every speaker today is an expert in his particular line and has prepared a message expressly for you, I am sure you will all derive some benefit from them. The first speaker on the program is Mr. George P. Hambrecht, on that very live and important subject, Industrial Relations.

After each paper is presented, you are at liberty to ask questions and have a general discussion. If you have any questions in mind or if you do not agree with any of the points brought out by the speaker, do not be backward in expressing your sentiments. After every meeting someone has come to me and said, "Well, I didn't just exactly agree with that fellow that spoke to us today, but I didn't want to get up and start anything." Yesterday, every speaker was perfectly willing to answer any questions you had in mind, and the same thing holds good for today's session and every other meeting we may hold in the future, in fact these gentlemen who come to address you expect to be heckled and cross-examined and are sadly disappointed if you do not do so. Now, you all came here to get some information and the speakers came here to give you that information. They give you their prepared paper to get you started asking questions that will bring out the main points in their address in which you were most interested. I take great pleasure in introducing to you our first speaker, Mr. George P. Hambrecht, who is from my own good old Badger State and Chairman of its Industrial Commission and is also Chairman of the Industrial Commissions of the United States and Canada, Mr. Hambrecht.

Mr. George P. Hambrecht: Gentlemen, I have no set speech. I came here to give you a few experiences that have come across my path in the administration of the work of the Industrial Commission of Wisconsin and I would be very glad if there are any questions in the mind of anyone if they would ask them, not that I may be able to answer them because I am a passenger, the way the rest of you are, but it is through discussion that ideas may be brought out and finally formulated, perhaps, into action.

You know, human beings are timid. We are not apt to confess that to ourselves. We think we are brave, we think we are fearless, we think that we meet problems vigorously, but back of it all, you know, there is a little timidity in the nature of all of us.

That was well illustrated this morning, not peculiarly because it is the ordinary situation. Men will come into a hall to listen to an address and get just as far away from it as they can. They are a little timid about coming close to their problems. That is true of nearly every gathering. I do not believe I have ever seen an exception but what they will get fringed around just as far from the thing they came to hear as possible.

We carry that thing unconsciously through our lives. We meet the labor situation with the same degree of timidity that we meet a speaker on industrial relations; just a little bit of timidity of getting very close to him. Once in a while there is a braver spirit that plunges in like a bull in a china shop, and, in common parlance, spills the beans.

I am not unmindful of the oft quoted sentiment from Shakespeare that it is easier to teach 20 men what you want to be done than to be one of the 20 to follow your own teaching. And I am not here in the role of a teacher or as an expert to tell you what you can do in industrial relations. You are a great deal closer to the problem than I am and you can tell me many things that are more practical in the line of industrial relations than perhaps I could.

I am here rather to discuss some of the underlying principles as I see them. If I see them darkly I would be very glad to have you ask questions so that I may see them more clearly.

One thing I think is important for us to bear in mind, that correct industrial relations, as we understand the term, has nothing whatever to do with strikes or lock-outs. Your best industrial expert is usually helpless under these circumstances. You have got to a point when there is a strike or a lockout where all industrial relations schemes seemed to have failed. They have failed because somewhere back in your plant or back in your community or back in the state or the nation someone has slipped a cog.

Now, where they have slipped it is your business to find out. You are charged, among other duties, with keeping correct industrial relations in your plant. But, if things come to a pass where there is a strike something has slipped somewhere. You may be to blame; your men may be to blame, a combination of both may be at fault.

So consequently the few remarks I have to make do not deal so much with strikes and lockouts, because then you have industrial war and usually the stronger wins out, which ever may be the stronger; it may be your association or labor organization; it may be your employers' organization or your own individual plant; and the most that the state can do, or the most an outsider can do under circumstances of that kind is not to arbitrate because arbitration carries with it rather an arbitrary sound in which you tell people what they must or should do and that gives little or no satisfaction to anyone for as a rule the lion gets the lion's share, being the stronger.

The more correct thing for an official to do when brought into a strike proposition is to find out, if possible, wherein the differences arose; if possible find out the points of contact, or agreement between the parties rather than to center your thought on the differences.

I have been drawn into many strike propositions as Industrial Commissioner in Wisconsin, interviewing both representatives of labor organizations and representatives of management. I hear, without asking questions, wherein there is a difference between the two. If I center my thoughts and carry on the process of conciliation from what I hear on the first argument, nothing can be done. And so I have got to dig down, if I can, and find out not what they are talking

about as to their differences, but find out where they agree, what things are they not quarreling about, rather than what things they are quarreling about, and approaching it from that angle I may see whether there are points of contact. If there are enough points of contact you can perhaps have it settled.

Now, correct industrial relations is to say, conduct your plant or organization, be it a paper mill or whatever it may be, so as to avoid industrial war, so as to avoid strikes and turmoil and misunderstandings because that only leads to disaster, both for your management, for your laboring people, and for the public. No good comes from industrial war. Everybody will concede that, whether it be management or labor. Labor does not dispute that any more than you dispute it. But back of it all there must be something that has led to dissatisfaction between labor and management. When we stop to think that the capitalist system, as we know it, has come in only with the introduction of machinery which, at most, is about a century old. We are going through an experimental period in manufacturing on a large scale and for the first time in the history of the world has the industrial relations between labor and capital become acute.

Now, that the industrial minds of the world are turned upon this problem, both earnest labor leaders and earnest and conscientious employers of labor, I have no hesitation whatever in believing that this question is going to be solved and solved quickly. It is futile for me to tell you how it will be solved. No one man is going to solve it. But the combined efforts of all the thought that is being put on this will solve the question as it has solved every other human question that has come up for attention. So to speak the limelight is thrown upon it at the present time and thought is being given to it. Heretofore little or no thought was given to it because the old relation of employer and employe as it existed for centuries and centuries had been carried into our industrial situation and if that industrial situation is not adapted to our present situation then some plan will be worked out by which a more equitable distribution of responsibility and profit and ideas will be carried out.

There is an old fable of the mice being afraid of the cat and they held a convention and they decided that if the cat was belled there wouldn't be so much fear. But, of course, when it came up to the proposition of who was going to bell the cat, it created a great deal of consternation among the mice and the cat went unbelled. We are in very much that situation now. There is a sort of unsettled state of mind with reference to the labor situation, and we are looking around for someone to bell the cat. But you know you are not going to solve it that way; it is not going to be solved through scaring off anybody.

Here is a problem that we are right in the midst of and we have got to solve it. You can't solve it alone, I can't solve it alone, and I have talked to labor organizations and they have told me that they cannot solve it alone. You have got to solve it with the best thought on both sides of this proposition; you have got to get the best thought of sober labor people with the best thought that employment or management can furnish and together this question is going to be solved.

Now, there is a great difference in industrial relations between right and duties. The same answer can be given to the question now as was given six thousand years ago to the query, "Am I my brother's keeper?" I believe that the first industrial relations problem came up at that time and the first query was raised with reference to it was "Am I my brother's keeper?" And I believe the answer inferred that there was something in our relations with our brother that made us his keeper.

Now, that question is up before us today, "Am I my brother's keeper?" We are. That is just as true of labor leaders and labor organizations as it is with you, and I will propound that question—and my only regret is that there are not some labor leaders represented here at this time—it is not a question for you alone, it is for them to ask themselves as well as for you to ask yourself, "Am I my brother's keeper?"

There is no difference between industrial relations and neighborhood relations. We have to get along with our neighbors. Now, some men can't get along with their neighbors because they have too much selfishness. Now, that kind of man wants to analyze himself as to why he does not get along better. Some industrial managers do not get along with their men—too much selfishness.

We will get out of this thought just what we put into it and no more, and if we begin to think that we owe a duty to those with whom we are associated, a considerate duty; a duty to see problems through their eyes as well as to try to induce them to see the problem through our eyes, until we can get to that point the question of industrial relations will not be solved.

I remember there was an old settler at Grand Rapids that told me this story, that while he was in New Lisbon at the time they used the teams to haul the necessities of life from that station up to Grand Rapids before the railroad was installed, that he listened to two people that had just recently come from Grand Rapids and were moving away and what they said to a new settler on his way up there. And the new settler, anxious to know what kind of community he was going to, asked one of the men, "What kind of place is Grand Rapids?" And one of them said, "It is the worst place on earth. It is the jumping off place. I wouldn't live there if it was the last place on earth. The people are no good; their institutions are no good; I don't like them and that is why I left."

Well, the man was somewhat discouraged. But he saw the other fellow who had come from there and he asked him what he thought about Grand Rapids and he said, "It is the best place on earth." He said, "You know, I hated to leave Grand Rapids, but I had a flattering offer in the southern part of the state that I could not afford to turn down. But, you know, I never hated to leave a place so in my life. The community is good, the people are good, and it is a fine place to live. You will like it." What was the difference, now, between these two people. It was the mental attitude on the part of the men. That man that did not find any good in Grand Rapids was not going to find good wherever he went and a man who did find good in Grand Rapids would find a more glorious place in the place where he was going and that man was unselfish, he was willing to get the benefit out of life through service to others.

And so, in industrial relations, it is a mental attitude as to how you can most benefit those with whom you are working, wholesome, genuine benefit, and I do not mean by that slobbering sentimentality because that is not benefit, but real, genuine service; service for the greatest good in order to evolve real progress.

Now, I have seen organizations meet, one as high as 5,000 people, that were swayed by the argument of the speaker dwelling on all the ills of human nature and dwelling on all the troubles that occur to all of us, as far as that is concerned, and centralizing it on his audience and getting them into a frame of mind that there was something wrong with society, that there was something wrong with the world and that the only remedy was drastic and radical action. And the people went out, inflamed with an idea of destruction; I don't mean physical destruction, but tearing down all institutions, criticism, a desire to do harm instead of good and out of chaos maybe something would arise which was better than existed at the present time.

I attended a meeting in Washington while I was down there on the labor question and Billy Sunday was holding a revival meeting, and I saw him addressing an audience of perhaps 15,000 people in his tabernacle. Instead of doing what this fellow I have just described was doing, he was telling them of all the good there was in the world and of all the power for uplift and all the benefit that might be gained with right thinking and good thinking and putting that good thinking into right action. And, as the common saying was, after the meeting to find out how many were impressed, they hit the sawdust trail and came up in droves in order to shake hands and went out impressed; impressed to do good for the world.

Now, what is the difference between these two people? What is the difference in human mind? The same people that went out of the first meeting that was addressed with an idea of all the ills and all the evils that is in the world, and the only way to get rid of them was to destroy something, had they been addressed from the other viewpoint, would have gone out with a different attitude toward life. It is a question of approach and the mass of people want to do the right thing, but in large masses you cannot very well appeal to reason. The larger the crowd the less reasonable argument will go.

If I want to convince a man of the reasonableness of a proposition, I want to get him across the table and talk to him backward and forward and where we can get down to brass tacks regardless of where it is going to take us, then we can arrive at some reasonable, logical conclusion. But if I have a mass of people to talk to, there are many little things that interfere with the continuity of thought with the mass; the rustle of paper; little by-talk for a moment—I lose the chain of thought, lose interest, and they will get up and go out.

And so the orator knows that little trick and he throws to the wind the appeal to reason and he appeals to a thing that gets action quicker than an appeal to reason; and that is an appeal to passion.

Now, passion is of two kinds. Passion may be for good or it may be for evil. And so, large assemblies are usually swayed by some passionate appeal.

We say the day of oratory is past. I have heard that. I heard that when I was attending the university, that the ancients used to move their people by oratory, but today they are moved by reason. That is not true.

I am just going to cite you a little illustration, and I don't mean any discredit on the recipient of this: But at the democratic convention in 1896 there were many prominent names mentioned as possible candidates. None of the lists included that of Bryan. He came as an ordinary delegate from an ordinary state and attracted but ordinary attention. And, over the table in talking with his colleagues he would have been considered an ordinarily intelligent man. But he rose before that audience and by painting a beautiful picture appealing not to reason but to passion. Anyone that will analyze and read the speech, the so-called Cross of Gold speech, will find it full of economic fallacies and admittedly so, but beautifully constructed, appealing to a wrong that existed in this country, a wrong that with the proper remedy applied could be corrected, and winding up "They shall not crucify labor upon a cross of gold nor press upon his brow a crown of thorns."

Now, you and I know that Mr. Bryan setting down with two or three of us never would have said that over the table. Of course, he wouldn't have said that. But he said that to the audience. Why? He had raised them up to a point of intensive, passionate interest. Having got them to that point he used a great word picture of crucifixion, and they looked upon Bryan as the deliverer of the democratic party, and nominated him for president, carried away by passionate appeal to a large assemblage of people.

Now, that is done today. It is being done in all large assemblies and you have got to reckon with that idea of an appeal to passion.

I just briefly analyzed last night some of the things that are good, in this passionate, emotional appeal and some of the things that are bad. Reading in the first column are the good things, and the good things can be appealed to with proper presentation to arouse the passionate interest just as well as the bad, but too seldom is that weapon used. More often is it used to appeal for selfish purposes. We have virtue and vice, we have love and hate, we have hope and despair, we have bravery and fear, we have gladness and anger, loyalty and treachery, generosity and selfishness.

Now, not one of those things have I read can be reasoned out. You cannot reason love, hope, bravery, gladness, loyalty or generosity. They are beyond the domain and realm of reason. Those are the things that are appealed to through our passions and our ambitions and the man that can arouse those things within us will get action a great deal quicker than he will get action through cold reason, and the man that appeals to the hatred, despair and the fear and the anger and the treachery and the selfishness within our nature, will counteract the arousing of these other passions.

And those are the things that are being aroused today. It is our duty to see that the good is placed before the world to counteract the arousing of those other passions.

And let me tell you this: There isn't any difference in human nature, there isn't any difference in you people that are sitting before me than if there were a similar amount or number of delegates of labor unions sitting before me. They are moved by the same hopes, they are retarded by the same fears, they are appealed to by the same love and they will act from the same hate that you and I will act from.

Now, it depends upon the avenue of approach with reference to these things. We are all in the world together and let's make the best of it and not the worst of it. It is your duty and mine to see that the good in human nature is brought out and not the bad. That cannot be done, however, unless we are absolutely honest, first with ourselves and then with our neighbors. If we are not honest with ourselves, and we are not advocating something which is industrially honest we cannot impress those with whom we are associating with the genuiness of our appeal. First purge ourselves of all unselfishness, of all desire to get the best of somebody, and imbue ourselves with the idea of getting the best out of that person at the sacrifice of something on our part so that we can pull together, and we will get industrial harmony.

The question was asked as to which of the three elements in the industrial world is the most important; whether it was labor or capital or management. And, you know, when I hear a question like that it reminds me of the old high school debating question as to who was the greater man, Washington or Lincoln. You know it don't lead anywhere, debating or trying to analyze a question like that. It can be best answered by the question as to which leg is the most important on a three-legged stool. You can't answer it. Those three things are absolutely interdependent. With our present industrial situation they all three must be there or we cannot have industrial production.

True, there are those who are advocating the abolition of a capitalistic system, thinking that out of that something better may prevail. With those I cannot agree. However, if that doctrine is true it is capable of proof; if it is not true it is capable of proof and those that believe in the contrary principle will not make anything by calling names to the parties that are advocating an abolition of the capitalistic system. If you think that the present situation involving management, labor and capital are necessary for economic production, it is up to you and me now to prove it and the burden is on industry to prove that proposition. If it cannot be proven, it is going down and that which is right and can be proven to be right will supersede it. And so I repeat again the necessity for careful economic thought on these questions.

One of the fundamental things which all men have in common is a desire to create. We all want to do something. And that idea was imbued in us from the time we started to make mud pies on up to the time when we earned our bread with the sweat of our brow. Now, there is something in industry that may stifle that idea of creative production. It should not be. A man must have something to think about in connection with his work that is creative. If you don't give him something to think about in connection with his work—there are those in society who believe in tearing down our system, that is going to give him something to think about—but he is going to think and he ought to think, and we would like to have him think along correct lines.

I will give you an illustration of that. You find a man out of work and he says, "I haven't got any money and I haven't any work, and I would like to get a job." And you haven't any work for him, and you try this on him out of the goodness of your heart. You say, "All right, I will give you a job. I have a pile of stones over in the corner of my lot that I would like to have moved with a wheelbarrow over to the other corner and piled up neatly." The man will go at it with a will and some degree of interest and carry those stones to one side and pile them up. If he has anything in him at all to make him good, he will probably pile them up neatly. At any event he will pile them up and the difference in character of workmen will be shown by the way he piles them. At the end of the day he has moved that pile of stone and you give him the day's wage and he says, "Have you any more work?" And you scratch your head and finally say, "Yes, I have a job for you tomorrow." "All right." And tomorrow he comes. "What is the job?" "I would like to have you take that pile of stones and move them back and pile them up." Well, the man will probably do it, but not with exactly the same degree of enthusiasm or spirit that he did before. But he will pile them up. But the next day he will still need some more money and you still want to do something for the man. But not giving any thought as to how you are going to do it, you tell him the next day, "Put them back in the next corner again." And the chances are he will tell you to go to hell. Now, why? Because you have destroyed in that man the creative spirit. That is all you have done. What difference does it make to the man whether he wheels them back and forth or not? It makes a lot of difference to him.

Are we doing in industry today something that is stifling interest of the man in his work? If we are it is your business to see that some sort of interest is aroused in connection with the work that he is doing, either in connection with his immediate task or in connection with the industry as a whole. There is nothing like responsibility to sober thought. I will take the most radical minded man in the world and throw on him the responsibility of making good, and he shaves off one-third of his radical ideas immediately.

One of the things that has been worked out is the shop committees that have been organized. You know the most that I see in shop committees are that they put the responsibility and thought on the workmen, giving them something constructive to think about, and arouse an interest in the business in which they are working. It is getting away from moving a stone pile from one place to another with no thought whatever except the pay envelope. If there is anything that will deaden humanity, that will. And yet we blame labor for revolting against the situation of moving stones back and forth. Can you blame them? If you and I were laboring on the same situation we would revolt too, because it is crushing a natural instinct which the Creator put there, a desire to do something constructive.

Now, what you are going to do isn't for me to tell you, it is rather for you to tell me. It is your problem to give your men something constructive to think about concerning their work in your mill.

It can be done and I know you can do it. You want to think about why these grievances have come up, and, when you have once recognized the cause, the cure ought to be comparatively simple.

You know a doctor treats a well man differently than he

does a sick man. The man that is sick gets all sorts of drugs, radical treatment and things you would never think of giving to a well man. It is the same thing in any industry. If you have a strike or labor trouble you have a sick proposition on your hands, but when you haven't a strike, that is the time to think about these questions, when things apparently are moving all right and you are conducting your business so as to get a satisfactory crew of workmen, a satisfactory management and a satisfactory bunch of capitalists who are getting a reasonable return out of your mill, and in that fair dealing comes a distribution of your profit, your wage situation and your safety appliances and your environment for work and all those sort of things. Those details must be worked out along fair lines, with the idea of service to labor as well as responsibility to those for whom you work, known as capital.

Now, with reference to the present crises—the time is going faster than I thought and I will just touch on this—the world today is suffering from under production and I have talked with hundreds of people with reference to the present ill and they all agree to that; labor agrees to it just as well as you do. Don't think for a minute that the labor leaders disagree with that. What they are afraid of is that if they begin to produce—that if production is increased they may lose their job. That is a false idea. It is up to those who are captains of the industry to eradicate that idea. I have talked with employers and they jump at that proposition immediately. They say, "Of course, we are suffering from under production but labor is to blame for it." Well, I have given you just briefly why labor may have caused some of the disturbances and they are not altogether to blame for some of these things they may have been thinking about. They say to me, "Now, what I want to get our men to do is to realize that." Can't you tell them that they ought to produce more and that they are standing in their own light? I said, "Sure, I will tell them, and that same employer writes in to the Labor Bureau and says, "You see, we are suffering from under production, and yet you won't let us work children that are under 16 years of age. If we can work women 12 hours a day we can increase the production in our factory. If the men would only work 12 or 14 hours a day, I would show you what I can do in production."

Are we inconsistent with reference to the rulings we are making on that? Is labor inconsistent with reference to the demands they are making? Increased production does not mean increased production in your mill to such an extent that next week you will make a record production that all the world will stand and say, "There is a deed that is marvelous." Is that what you mean by maximum production? You may do it and kill off half of your workers.

Now, when I say that we need maximum production I mean that the whole world needs maximum production with the greatest possible conservation of human labor spread over the years. There is a limit to which children should work, and where they shall work; there is a limit to the strain you should place on women and the strain you should place on all your employes with reference to a maximum production spread over a long term of years. What we want to do is to produce the most possible in this world, conserving each worker to the highest degree.

Who is thinking about this maximum production the most? I am very frank to tell you the laboring people are thinking most about it, with this idea in mind, with the one idea of human conservation and they are bringing down every limitation which has a tendency to limit immediate production and you are resisting that just simply because you say, "I don't think it amounts to anything."

Many employers are making a real study as to what is maximum production with minimum conservation? Have you given it any thought or have you let the laboring people do all the thinking on that? Now, you can get together on that proposition. I haven't the least hesitation in my mind whatever but that the same labor people that agree with you on maximum production will get together on hours, will get together on wages and will get together on working conditions. Those are only incidents in this great problem.

The real thing to be careful about is not to kill the creative spirit and not to have labor feel that it has no responsibility whatever except to walk up and get the pay envelope after the week's work. The laboring man wants some responsibility and you can give it to him without surrendering the management of your industry. Management belongs to the person who has a peculiar aptitude for it, and there is plenty of room at the top for any man who can demonstrate that aptitude. I know what I am talking about and so do you when I say that the field is not crowded with successful superintendents and with men who can successfully manage a business and the field is open for anybody who can do that thing.

But the door should never be closed between labor on the one side and management on the other, and in this democratic country it probably never will be closed. A man can start from the humblest walk of life and become a captain of industry through his own efforts.

Some of the things that cause unrest among laboring people are anxiety and uncertainty and discontent and they all mitigate against intense interest in the work and they tend to reduce production. It is your business just as much as their business to reduce that anxiety, to reduce that uncertainty with reference to his job, and so far as possible, get from his mind a discontented attitude.

There are many things that could be said along those lines and I would like to analyze them a little more at length perhaps if the time were not fleeting, but I just want to give you one other thought, and that is with reference to the method of appeal. I touched on that briefly in my opening remarks. I do not know of any better historical illustration than the method of appeal of Ingersoll as compared with the method of appeal of Lincoln. You have got two rather antagonistic characters there and I just want to quote briefly the method Ingersoll used in a political speech with reference to the southern sympathizer during the war of the rebellion, a thing that might be criticized with a great deal of vigor, and this is what he said, paraphrased: "Would that there were words of pure hatred out of which I might construct sentences like snakes, sentences with forked tongues, that would writhe, hiss and bite. Then I could do justice to the copper heads of the south." About the same time that Ingersoll gave utterance to that, strange to say, rather unpopular at that time, as it was—Ingersoll said the popular thing. Lincoln gave voice to this sentiment: "With malice toward none and charity to all, with firmness in the right as God gives us to see the right, let us strive on to finish the work that we are in."

Now that illustrates the difference at that time. Today we have the same thing. We have the man of vitriolic condemnatory language, exhausting the dictionary for terms to describe those that are causing them annoyance and, happily, we have today the spirit of Lincoln that is approaching this problem with malice toward none and charity for all. If this problem is going to be solved, it is going to be solved in that way, the way the Civil War problem was solved. It was not solved in any other way. And your industrial problem is not going to be solved in any other way. You are not going to solve it by condemning and damning people, but you are going to solve it with malice towards none and charity to all. I thank you. (Applause.)

The President: Members of the Superintendents' Association, I believe that Mr. Hambrecht's address was the best that has ever been delivered on this subject. I know that it was the best that I have ever heard, and I am sure that you have all received something worth while from his message, something that you can take back home with you and assist you in solving the various problems that you have to encounter in your line of duty. If you have any questions that you would like to ask Mr. Hambrecht, I know that he will be only too glad to assist you in any way. If you do not wish to ask them in open meeting, he will be at your service after this session is over. Our next speaker this morning is Mr. W. T. Schmitt, of the American Writing Paper Company, who will endeavor to describe to us all the advantages of a paper mill cost system. He has worked out a cost system that I have been told is considered the very best that has been worked out by any paper mill up to the present time and which has the hearty co-operation of his superintendent. I take pleasure in introducing to you Mr. Schmitt, who will now tell you superintendents why you ought to have a good cost system in your mills. Mr. Schmitt.

Mr. W. T. Schmitt: Mr. Chairman and members of the Superintendents' Association, the first thing I wish to do is to remove an erroneous impression. I am not the author of the cost system to which your worthy president referred in such appreciative terms. However, I am connected with Mr. Hutchinson, the treasurer of the American Writing Paper Company, who has evolved this system. I have been requested by your Mr. Massey to address you on the subject of Cost Systems in Paper Mills. I do not propose to enter into a lengthy discussion of the relative merits of the various methods of cost finding as practiced by different concerns. I do not think you would be interested in that phase of the subject, but I will attempt to give you several reasons why a cost system will be of great assistance to you in carrying on your work.

(Mr. Schmitt then presented his paper, which appears elsewhere in this issue.)

The President: As each succeeding paper is presented, I notice that some of the members in the rear move up forward. I am sure that a large number of you present were very much

interested in this paper. The cost system, gentlemen, has fulfilled an important need in our industry, and like every thing else that fulfills a need, it is here to stay. Every member of this association should endeavor to co-operate in this movement and assist in the installation of the right kind of a cost system in his mill, which means that he should attend some of the local meetings of the Cost Association and familiarize himself with the various systems so that he may be able to advise intelligently on the kind that will fit his particular mill. The next address is on the subject of Paper Mill Roofs, by Mr. K. Barth. This is a trouble that has been experienced by every one of you at some time or another, and I know that you will agree with me when I say that it is some job to have to take a mill roof down and put another one on. I am sure that you will be very interested in what Mr. Barth has to say as to how this labor may be eliminated. Mr. Barth, gentlemen.

(Mr. Barth then presented his paper.)

Mr. Barth: Primarily, the elimination of the necessity of continually replacing timber in your roof construction, and other parts of your mill because of decay is an economy, and as such is of very great importance, particularly at the present time, and in the near future, because every cent that you can save on your overhead expense is just that much more profit. In fact, the time is coming, and coming quickly, where waste and inefficiency—permitting wood to rot is inefficiency—must be eliminated in order to make a profit. That not only applies to your industry, but it applies to every other timber using industry.

The superintendent of a paper mill is particularly interested in the profit that his mill is making, because his personal profits and his reputation depend to a very large extent upon the profits that he can show in manufacture and overhead. Therefore, any innovation or improvement that will cut down your overhead expense will be of interest to you. In the slides that will follow, I expect to show you some conditions with which you are all familiar. I also expect to show you some practices that have been developed and introduced to overcome these conditions.

Wood preservation merely means the prevention and elimination of decay. Briefly, decay is a disease that attacks wood. The disease is not caused by moisture, it is not caused by any other one condition alone, but there are three primary elements which when developed to a certain degree permit wood destroying organisms to develop and attack the wood. They are moisture, air and warmth.

(Note: Forty-seven slides were then shown on the screen and each one explained in detail. Only a few of the more important remark are quoted here from the original transcript.)

In this particular slide you see them removing a decayed roof deck. This is not an uncommon occurrence; in fact, it is a too common and very expensive occurrence in paper mills all over this country and Canada.

Here is a paper mill roof that has been up nine years. In the construction the best possible timber had been used, longleaf yellow pine, and it is also gone. The same timber in an exterior construction, a trestle or something like that, would have lasted for at least fifteen years without any appreciable decay.

This is a number of planks removed from a roof because of decay after the usual service of seven or eight years, and illustrates the failure to preserve wood by putting on a so-called waterproof coating. The same thing applies to the use of a viscous paint. You cannot protect wood from decay unless you poison it against the organisms that cause decay.

In this picture you see the development of the wood destroying fungi. The fungi or wood destroying organisms are here shown penetrating the cell walls which causes the weakening of the cell structure and its collapse, or the so-called dry rot, with which you are all familiar.

This is the fruiting body or final stage in the development of this species of fungi. The life cycle of these wood destroying organisms is the spore, or the seed which settles on the wood, and if the conditions are favorable these seeds sprout into the root or mycelia stage, which again develops into the fruiting body, which is the final stage. These fruiting bodies propagate additional spores, which are carried by the winds and other mediums, to be deposited on other timber, and continue the cycle.

Here is a picture that I took a number of years ago of some ventilators of an old type of construction. I was told that those ventilators were merely brush treated about ten years before I took the picture. At that time they were being painted green for appearance sake, and those ventilators were still apparently in good condition.

This is a paper mill in the state of Wisconsin. Probably some of you present will recognize the picture. No. 1 is a roof deck of Douglas fir. I am told it was treated by pouring the preservative over the top of the deck after it had been laid. The architect for this mill informed me that after six years of service a section of the roof was cut out and found to be in perfect condition, whereas the previous roof had been destroyed by decay in eight years. This method of treatment is not as efficient as can be used where proper conditions can be arranged for.

This is a so-called open tank process and is a good illustration of the Open Tank Process Plant of treating timber. The reason I am going to dwell longer on this process than on the others is because under almost all conditions it is the process most easily available to the paper mill. It merely consists of using a refined coal-tar creosote oil, and of steeping the lumber in the creosote, first in a hot bath, and then in a cool bath for various periods of time which are determined and controlled by the character of wood being treated, that is, by its susceptibility to absorb creosote oil. In other words, if the wood is of a species very resistant to the absorption of oil the treatment has to be prolonged; if it is not so resistant the time of immersion can be reduced. This is the construction of the tank. It is simply a wooden tank lined with sheet iron, soldered at the joints, equipped with steam coils for heating the oil and of a size suitable to your needs. When the hot and cold treatment is required, two or more tanks will be necessary to do the work; sometimes one tank will be sufficient to meet your requirements.

This is a two tank plant; wooden tanks lined with galvanized sheet iron, that was erected by a paper mill in Minnesota for the treatment of their roof decks. And in that connection, I understand that the first roof of Norway pine lasted three years. The second roof was brush treated with a coal-tar preservative and lasted eleven years. The boards for the third roof were treated in these tanks by the open tank process and should last twenty-five years. Now is that economy? This same mill used this type of girders and laminated construction; in other words, 2x12 bolted together. Now that is an economical form of construction. It is a form of construction for so-called temporary or quasi-permanent work, and is coming more and more into prominence. This type of construction if properly treated is to be advised as it is much cheaper than solid timber construction and often stronger.

This is another tank that a paper mill built. The end tank is the hot bath tank and the tank to the right is the cold bath. Now you will notice that the capacity of the latter is greater than the capacity of the former. The reason for that is that the hot bath requires just one-half the period of the cold bath. Consequently the cold tank has to be made larger in order to have the same capacity as the hot tank.

That brings me to surface treatments. By surface treatments I mean a treatment that is applied to the surface, differing from impregnation treatments which force the oil into the wood. It consists of painting two coats of creosote to the wood, spraying, or just a light dipping, and the object is to coat the surface in order to obtain a temporary increase in the life of the wood. It is merely the application of creosote oil by painting, spraying or dipping. The most successful results from treated timber in paper mills has been accomplished by surface treatments. The use of the open tank system, and the pressure system of treating lumber is a comparatively recent innovation. The older mills throughout the country which have used any kind of wood preservative have usually resorted to one of these means for its application and they have been successful. If they have more than warranted the cost by the results they have achieved by this method, it is certainly positive that you are going to get much better results from the more efficient methods we now advocate.

This illustrates the spraying of timber, which has the same object as painting excepting that you save labor and can do the work more speedily. This mechanical sprayer costs $250.00, but it can be used for painting anything about the mill. It can be used for creosote one day and for white paint the next by blowing out and cleaning the receptacles. The only difference is that you need a steam hose for spraying creosote. When you order a machine of this kind, mention that you wish to use it for creosote, and they will supply the proper hose. There is no appreciable waste when using these machines.

Timber must be framed before treatment. In other words, if you have treated timber by injecting creosote oil, and then cut away half of the surface, you have practically destroyed the value of the treatment. Where a brush treatment has been applied to the exposed surfaces, the value of the entire treatment is only equal to the value of the brush treatment. The timber should be completely framed; all but bolt holes, etc., should be drilled before treatment, then you get a continuous film of the preservative all around the wood that protects the wood from attacks by fungi as long as the film re-

mains intact. I cannot emphasize that fact too much. It must be framed before treatment. Of course, occasionally it is necessary to drill an additional bolt hole; everything cannot be foreseen, in that event be sure that the exposed wood is covered with creosote oil either by means of spraying or with a brush.

Here is a block, a creosoted wood block, that was laid in New Orleans in 1878. The street is still in existence, still giving service, and this block was removed for inspection in 1918; forty years of service. There isn't a very clear record exactly as to what method of treatment was used, but, however, whatever treatment was used the creosote was injected throughout the block and the creosote has maintained that block in perfect condition for forty years.

(Showing of slides completed.)

Of course, there are other means of overcoming the ravages of decay in roof construction, as the substitution of other material for roof decking, and some materials are very satisfactory under the severe conditions applying. However, in the final analysis the comparison is the annual cost of the structure; what will it cost you to maintain a roof deck under the prevailing adverse conditions per year of service probably for the next twenty-five years.

A number of these slides I showed you were furnished me by Mr. Hoxie of the Associated Mutual Fire Insurance Companies of Boston. Mr. Hoxie has also advanced a type of roof construction which I think is worthy of consideration. It is this: A two inch ceiling, or lower deck, over which three layers of felt and pitch are applied as a water proofing membrane; a second deck, immediately on top of this water proofed deck, of two or three inch plank, creosoted, and on top of this the five ply felt, pitch and gravel roof. As flat a roof as it is possible to construct. Then you have a permanent type of construction at, in most cases, the lowest possible cost. Why? Because you have water proofed the most important part of your roof or that which would decay most rapidly. Decay in a single deck roof starts at the top, as a rule, because condensation is greater at the top, underneath the roofing, than it is at the bottom. In other words, if you use apparatus to dry the air in your machine room, you nevertheless have condensation between the top deck of your roof planking and the roofing. In other words, the drying of the atmosphere in your machine room or your beater room does not eliminate the danger of decay of the roof boards. The ceiling underneath is not creosoted and consequently can be painted white if desired.

I have come in contact with a number of superintendents who insist that it is necessary to have a white ceiling. You can get it by that form of construction. I don't know whether it is really necessary. It is going to cost money, naturally, to paint a ceiling white and keep it so.

Now painting over creosote is practically impossible. Therefore, if you have exposed creosoted roof deck do not try to paint over it. There is one way of doing it and that is to shellac the creosoted surface, but naturally that is too expensive to be considered.

Fire hazard: Now there are a lot of engineers and architects who are still under the impression that creosote increases the fire hazard. At one time there was a ruling by one of the fire insurance companies against the use of creosoted lumber in that kind of construction. That ruling has been changed and the same insurance people now are recommending and advising the use of creosoted lumber in roof construction. You do not increase the fire hazard by creosoting lumber. Creosoted lumber, when dry, is not any more inflammable than untreated wood, and as the roof ages untreated wood is a greater fire hazard than any seasoned treated wood could ever be, because nothing is a greater fire hazard than partly decayed wood. A piece of wood that is punky and rotten is certainly going to burn much faster than a piece of sound creosoted wood, so, in that relation creosoted wood, as it ages, becomes a fire retardant.

Now the use of creosote material does not need to be confined to roofs. You have other parts of your mill where you can advantageously use creosoted wood; particularly wood block floors. A concrete floor is no place for a human being to work on; nature has not intended it to be. The efficiency of your workmen, the cost of your mill operation, the one is increased and the other is decreased by the use of the creosoted wood block floor. If your mill is such that you cannot put in a wood block floor, that should not retard the use of creosoted material in your floor construction. You can use laminated two by fours set on edge, creosoted, on your stringers which would give you very much more increased service over what you now have from untreated lumber, particularly in beater rooms or machine rooms and places of that kind where you use wooden flooring.

Another thing, the floors in your machine rooms would be a little warmer, a little more comforable for the men to walk and work on. They would work better. As we heard today, the more satisfied your labor is the less trouble you will have with them, so there are several arguments in favor of creosoted blocks.

Now, as far as preservative treatments are concerned, there are three standard treatments: The pressure process, which you cannot use because it requires too big an investment in the plant; only large corporations such as railroads who have an enormous amount of timber to treat can afford it, and big commercial companies that treat lumber commercially. For many purposes, particularly where the wood is to be exposed to mechanical abrasion after treatment, to the wear and tear of traffic and such conditions, pressure treatment is necessary. In other words, in such an instance the architect, or the engineer, or you should specify one of the standard pressure processes conforming to specifications which you can find by referring to the proceedings of the American Wood Preservers' Association.

In fact, practically everything in the wood preserving industry is standardized. You don't have to take anyone's individual word for it, you can refer to the standards if you just merely know where to get at them.

In some cases where a heavy impregnation is necessary you may not be able to get pressure treated material. In that event lumber should be selected that has the proper strength and which has the characteristics necessary to the absorption of creosote oil. Usually in such cases the open tank process would be more expensive than the pressure process; that is, under equal conditions. However, the open tank process can inject sufficient creosote oil into certain species favorable to treatment, equal, or sometimes greater than is permitted in the pressure process. The reason I say permitted is because the pressure process absolutely controls the treatment.

Now, the second treatment is the open tank process. The open tank process is the hot and cold treatment of wood in refined coal-tar creosote oil in open tanks or vats. It depends upon the atmospheric pressure, the gravity of the oil and the expansion and contraction that follows the difference in temperature between the hot and the cold bath, to obtain the required absorption of creosote, and it is necessary—absolutely—and there is no exception to that rule—that the timber be air seasoned, air-dry, before it can be successfully treated by the open tank process.

Third, are the so-called surface treatment which you have seen illustrated and they are for so-called temporary work. In other words, suppose you had a time limit on the usefulness of a structure, on the usefulness of a roof, and you knew that within a certain number of years that particular building, that particular mill, was to be shut down, moved, or for some reason become inactive, then your problem would be to increase the life of the lumber that you use from its natural period of life untreated, to the so-called mechanical life, and if the period of increase between these two definite factors is little enough to permit the use of a surface treatment, in other words, is not more than five years, then the surface treatment would naturally be the most economical.

Where you require permanency I would advise the open tank process, or in the event that you can purchase pressure treated material economically, I would advise that.

With regard to the word permanency. What is permanency? We hear so much talk from people that have materials for building purposes to sell that they have material that is "permanent." Now, you can exceed the limit of reasonableness in permanency. Under certain conditions too great a cost for permanence is certainly not warranted. If you can figure on an average life of 25 years for your roof, and if you can get that with materials, for instance, creosoted wood, and a good five-ply felt, pitch and gravel roof, why then you have almost a limit of reasonable permanency and it certainly is more permanent and very much less costly than what you have to contend with now. Therefore, in considering roof construction, or any other kind of construction where the conditions are favorable to decay, do not eliminate lumber simply because your experience has been that it has cost enormously for replacements. Use these means and methods for prolonging the life of lumber and you will find then that because of the availability of many species and lower first cost of lumber, you will have, as a rule—of course, there are exceptions to every rule—a lower cost per year of service than you will with other so-called permanent materials.

I am pleading for lumber, because, naturally, I cannot be interested in anything else as much as I am in lumber. I cannot put creosote on this other stuff. But, really, from the point of dollars and cents your engineers, your architect

Continued on page 778.

Newsprint Manufacturers

Great savings are now being made in POWER and Labor in the mills of

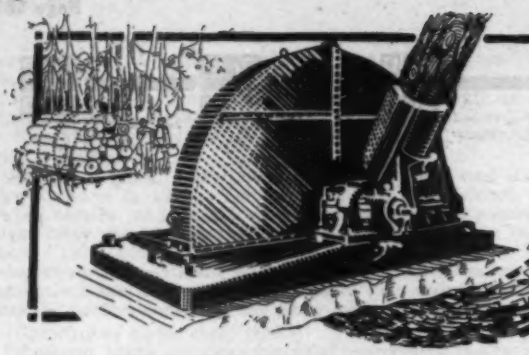
THE LAURENTIDE COMPANY
THE WATAB PULP & PAPER CO.
THE ABITIBI PAPER & POWER CO.

and others by the use of the

Griley-Unkle Extractor

Hundreds of these machines are in use in this country in mills making many classes of paper, cutting costs on those precious coal piles, as well as on the labor bills, and while this is interesting to all classes of mills, it is particularly so to

Boxboard Manufacturers

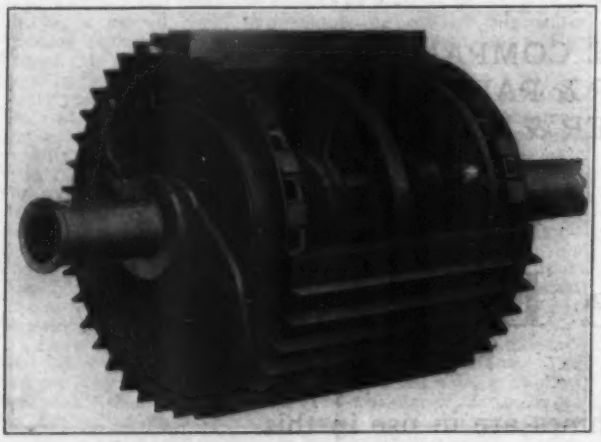


Chips of Information

Bandless Beater Roll

A new beater roll that has been received with more than ordinary interest is illustrated here. The following points are a few of the reasons why it is meeting with such success:

1. Slotless bars which means no broken ears.
2. A bar designed for maximum strength.



3. Lugs on heads machine finished insuring a perfect fit.
4. Bars require no shimming.
5. Wedges self centering.
6. Wedges drawn down by heavy wrought iron bolts with brass nuts.
7. Nuts locked by ribs on cover plates.
8. Damaged bars can be replaced without disturbing the others.
9. It is unnecessary to raise roll from bearings when refilling.
10. Roll can be refilled in one-fourth the average time.

Waterproof and Airproof Cardboard

Patent No. 1,320,540 issued to Otto A. Heppes of La Grange, Ill., covers the art of making carton board which consists in passing a strip of relatively thick pervious board through a hot solution of penetrable asphaltic material; then depositing, on each side thereof, a uniform coating of relatively hard substantially impenetrable and impervious asphaltic material and while in a sticky, or tacky condition covering one side of said board with a relatively thin parchment-like paper and simultaneously covering the other side with a relatively thin sheet of paper adapted to receive printers' ink; then applying pressure to the composite board to stick the members together and then cooling the finished product.

Process of Producing Soda Cellulose

By Erik Ludvig Rinman

Patent No. 1,319,360. No drawing.

By the use of the so-called sulphate process it is possible to produce qualities of cellulose which it has heretofore not been possible to obtain by the use of a caustic soda lye free from sulphur. It is well known that cellulose produced by boiling with soda lye free from sulphur is more difficult to bleach and is colored more yellow than ordinary sulphate cellulose. The present invention, however, refers to a process by means of which also with the use of caustic soda lye free from sulphur qualities of collulose are obtained which have quite the same appearance and which are at least equally good as those obtained by means of the sulphate process.

The present process consists principally in this, that the caustic soda lye used is treated during the boiling of the material by means of a contact substance furthering reduction. Mercury is especially adapted as such contact material. When carrying out the present process it has proved particularly advantageous to use as boling lye a caustic soda lye considerably more diluted than the so-called sulphate lye now ordinarily used. While an ordinary sulphate lye contains about 100 to 120 gr. Na_2O and Na_2S in the form of active alkali, there is preferably used according to the present invention a caustic soda lye containing about 60 gr. Na_2O per liter lye.

The said quantity of alkali, and even a greater quantity, being consumed during the boiling, however, a quantity of lye about twice as great as the one now ordinarily used would appear to be necessary for every boiling. It is also possible thus to carry out the process. It is also possible, however, to proceed in such manner that the boling is begun with the ordinary quantity of fresh lye but with about half

They Used to Spot the White Man By his Fire's Smoky Waves Now they Spot the Files Stoker By the Smoke its Fire Saves

Smokeless stacks are the eloquent signs of **Files Stokers,** Hand Operated. They are the outward evidence of furnaces that burn and convert coal into power only—later into profits.

The stacks shown below **are not** related to **Files Stokers,** Hand Operated. **Horrible examples**—are they not?

Files Stokers, Hand Operated, are **real combustion machines,** giving the same high efficiency as mechanical stokers.

At much less expense. Cost less to install. No expensive coal and ash handling equipment required. No remodeling of plant. It takes only a few days to install the **Files** under any furnace where coal is burned.

A fireman and the levers do the rest with closed fire doors. With

FILES STOKER Hand Operated

the firebed is kept level, ash and clinker removed, and the coal gradually consumed and moved down the inclined stoker to the rear cleaning plate.

With the Files you can get the high combustion efficiency of expensive mechanical stokers with lowest installation and maintenance costs.

Write for bulletin

THE FILES ENGINEERING CO., INC.
75 Westminster St., Providence, R. I.
Branches in Principal Cities

"American"
VEGETABLE AND ANIMAL GLUES

ECONOMY & UNIFORMITY of PRODUCT

The **Real Test** for Pastes, Glues, or other adhesives lies in their **Performance** under your own operating conditions and the **Results** achieved in your finished product.

Give us an idea of your requirements and conditions, and we will furnish you with the Best Adhesive to meet them.

"ROLLEO" Book Glues for Bindery.
"AMERICAN" Pastes for Mailing.
"FLEXO" Padding Glues.
"AMERICAN" Liquid Glues for Box Board and Other Purposes.
"AMERICAN" Glues for Container and Box Board.
"GOO-GOO" Make Ready Pastes for Pressroom.
"AMERICAN" Flexible Glues for Flexible Bindings.
"AMERICAN" Rollers Mean Pressroom Efficiency.

We guarantee that our rollers will fulfill your requirements satisfactorily or cost you nothing. Give us a trial order on these conditions.

American Printers' Roller Mfg. Co.
Grand Ave. and Franklin St., Chicago, Il

the necessary quantity of alkali, that is to say, to use a lye containing about 60 gr. Na_2O in the form of free NaOH per liter lye. During the boiling the necessary alkali is gradually supplied in the form of a stronger caustic soda lye, but it should not be supplied so rapidly that the quantity of free alkali in the lye is increased over the suitable amount, that is to say, over about 60 gr. Na_2O per liter lye. The lye thus supplied may be highly concentrated, from 10 per cent NaOH to a higher concentration, if care only be taken that it is supplied in such manner that it is allowed to mix with the other lye before influencing the raw material or the wood.

Utility of Low-Grade Calcium Lines in Casein Glues

Lime is probably the most essential constituent used with casein to produce casein water-resistant glue. Commercial lime varies widely in purity, but the degree of purity, according to tests made at the U. S. Forest Products Laboratory, is not a determining factor in glue making. It is only necessary that a sufficient quantity of lime material be used to insure the actual $Ca(OH)_2$ content called for in the formula. If this precaution is neglected the result from the standpoint of water-resistant qualities will be unsatisfactory.

When a lime of unknown analysis is to be used in a formula which has given success with other limes, it is desirable to begin with an amount which will give a glue of short or medium working life and satisfactory flow. In the formula studied at the laboratory, low-grade limes as gave a slow rate of solution of the casein, high viscosity, and abnormally long life. In any event, tests of the water-resistance of the glue in which the new lime is used should be made as soon as possible.

A Test of the Jelly Strength of Glue

The test described below is used by the United States Products Laboratory in place of the finger test for determining the jelly strength of glues. It is fully as sensitive as the finger test, and has the advantage of furnishing numerical results by which accurate comparison of different glues can be made

The instrument used in making the jelly strength test is a modified form of an apparatus developed by one of the large glue companies. Its essential parts are a light cylindrical frame, or float, which rests upon the surface of the jelly, and, moving vertically in the frame, a heavy graduated plunger, the depth of whose depression in the jelly is a measure of the jelly strength. The nose of the plunger is hollow, so that it may be filled with shot to bring the weight of the plunger to the most sensitive point for the particular jellies to be tested. By means of a set screw at the top of the plunger, the zero mark on the plunger scale may be set opposite the zero mark of

THE WORLD'S BEST FILLER

ASBESTINE PULP

(Reg. U. S. Pat. Office)

Finest White Color **Natural Fiber** **Retention 90%**

Every Way Superior to Clay

Prompt Shipments Guaranteed—Largest Mills in the World

INTERNATIONAL PULP CO., 41 Park Row, New York

RUSS GELATIN CO.

Factory—WESTFIELD, MASS.

MANUFACTURERS OF

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ANIMAL SIZING GLUE STOCK

LARGEST SPECIALISTS IN AMERICA ON

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E. F. RUSS COMPANY 201 Devonshire St. BOSTON, U. S. A.

James L. Carey

Paper Mill Architect and Engineer

208 N. Laramie Ave., Chicago, Ill.

"NORTHERN" Cranes and Hoists

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PAPER MILLS

We Desire to Buy the Following:

M. F. Bleached Ground Wood, 5,000 tons
Super Litho Hard Sized Sheets, 1,800 tons
Coated in Sheets . . . . . 1,200 tons
News in Rolls . . . . . 30,000 tons

For delivery during 1919-1920

Also interested in other grades current and contract

ADVISE IMMEDIATELY

Interstate Pulp & Paper Co., Inc.

Grand Central Terminal, New York City

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When it is a matter of

Barker Knives
Beater Bed Plates
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Paper Trimming Knives
Rag Cutter Knives
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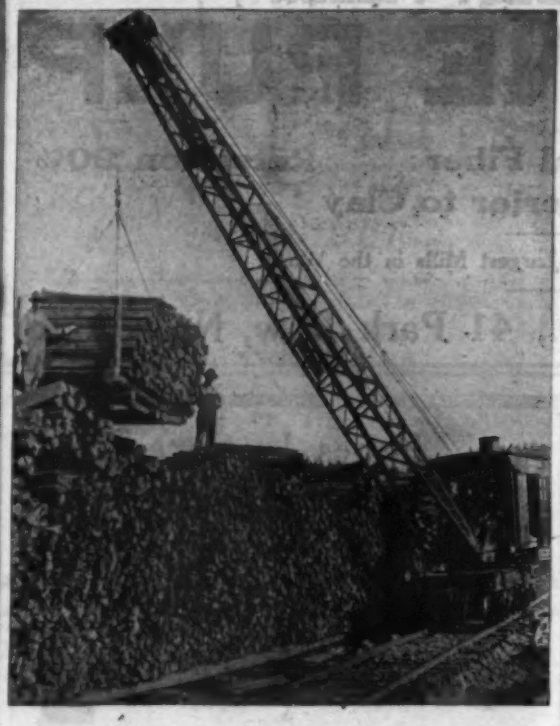
Of every description used in Paper and Pulp Mills

¶ Designed to meet specific needs and of uniformly High Grade.

John W. Bolton & Sons, Inc.
LAWRENCE, MASS.

CHIPPER KNIVES BARKER KNIVES BEATER KNIVES BEATER PLATES JORDAN FILLINGS



Handling Materials at the Mill

IS YOURS one of the many mills which handles considerable pulp? Some of these have found it to be more rapid and economical to do this handling with a Brownhoist locomotive crane. A Brownhoist will not only place the pulp wherever it is needed, but will handle your coal, switch the cars and take care of innumerable jobs which come up around the yard. If you have much handling to do, our long crane experience should be of use to you. We will gladly give you any information for the asking.

The
Brown Hoisting Machinery Co.
CLEVELAND, OHIO, U. S. A.

Engineers and Manufacturers of Heavy Dock Machinery Bridge Cranes, etc., as well as smaller Cranes and Hoists

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a scale on the frame. This setting may be done when the tester is resting on a perfectly level surface, or, for special purposes of comparison, when it is resting on the surface of a glue which is to be taken as a standard.

Further details of the construction of the jelly tester are shown in a plate of working drawings furnished by the laboratory.

A method of preparing glue for jelly strength tests with this instrument is as follows: Exactly 25 grams of ground glue are added to 300 cubic centimeters of cold water. The mixture is stirred, covered with a watch glass, and allowed to stand in an ice-box for two or three hours. At the end of that time it is placed in a water bath and gradually heated to 60 degrees centigrade, being stirred frequently but with the beaker covered to prevent evaporation. When the solution is free from lumps, the condensed moisture on the watch glass is returned to the solution, and the glue is poured into a crystallizing dish. A dish which is 3½ inches in diameter and 2 inches deep is very convenient for this purpose. The depth of the layer of glue in the crystallizing dish should be the same in every case. The dish with its contents is placed in an ice-box for twelve or fifteen hours at from 5 to 10 degrees centigrade.

A sample of standard glue is treated in exactly the same way and at the same time as the glue which is being tested.

Both glues are removed from the refrigerator at the same time, and three or four readings of the depth of depression in each glue are taken. The depth of depression varies inversely as the consistency of the jelly, though not in an exact mathematical relationship.

Expressed in percentage ,the jelly strength of the glue under test is equal to 100 times the depth of depression in the standard glue divided by the depth of depression in the glue under test.

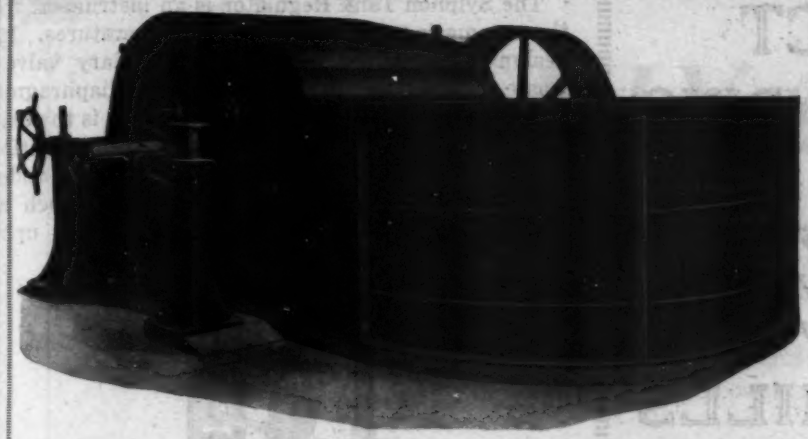
News Items

The Neura Paper Company's mill at Hadley, N. Y., is now running on high grade Kraft paper, after having been thoroughly renovated and a lot of new equipment installed.

The arrangements have been completed for the building of a paper mill at Port Arthur, at a cost of $5,000,000, by the Great Lakes Pulp & Paper Co., the leading factors of which are L. E. Alsted of Appleton, Wis.; George M. Seaman of Chicago, and James Whalen of Port Arthur.

The ground wood mill is to have a capacity of 30,000 tons per year, the sulphate mill 75,000 tons, and the news print mill 35,000 tons.

The Nekoosa-Edwards Company mills are now running 100 per cent at both Nekoosa and Port Edwards.



DILTS BEATING ENGINES ARE USED AROUND THE WORLD

DILTS MACHINE WORKS, Inc.

FULTON, NEW YORK, U. S. A.

Manufacturers of

Beating and Washing Engines, Fly Bars, Bed Plates, Rag, Chipper and Cutter Knives, etc.

Remember

WM. A. HARDY & SONS

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Originators and Oldest Manufacturers

OF THE

Cast Bronze Screen Plate

ALSO SPECIALIZE IN

Acid Resisting Digester Parts

One Man Does It

One man—any ordinary man—lifts a bale of rags or a roll of paper straight up to the ceiling and places it on a pile—if he uses the

ECONOMY SYSTEM OF STORAGE HANDLING

The Economy System makes one man equal to entire crews—makes all space accessible—reduces handling costs—releases men for production—and offers many other advantages. We shall be glad to give you definite facts. Address

Economy Engineering Co.

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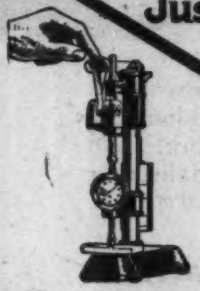
How Often Is It Just a Guess ?

Measures Every Physical Property of Paper



Can you test every piece of material that goes into your product?

—can you test your own product at various stages of its manufacture?

—or do you just guess?

You do not have to guess any longer.

WIDNEY MODULIMETER

This instrument puts the paper maker where he can deliver exactly what his contracts call for.

It enables you to determine and select just the quality of any material that is best suited to give A-1 results in your mill.

It shows the test results in plain figures on the dial—quickly and accurately.

You'll appreciate **The Story of the Modulimeter.** Let us send you a copy. It's mighty interesting—and practical.

Measures Tearing, Tensile and Folding Strength

Measures Stiffness, Resilience and Hardness

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MAIN OFFICE AND LABORATORIES:
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PERFECT ROLL GRINDING

of **Calender Rolls Brass Rolls and Rubber Covered Rolls** *for*

PAPER MILLS

is an impossibility except to those who have had long experience in this work. We are not only specialists in Roll Grinding, but we

Absolutely Guarantee Perfect Work

Tell us what you are making and we will grind your Rolls to give the Best Results. We have two large machines doing this work and can give you Service.

SEND FOR LIST OF SATISFIED PAPER MANUFACTURERS

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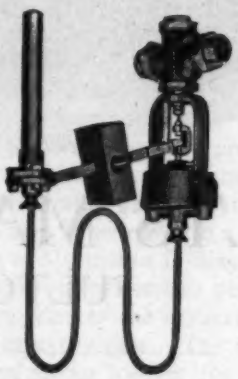
MIDDLETOWN OHIO

Reliable Temperature Regulation for Liquids

The Sylphon Tank Regulator is an instrument for the automatic regulation of liquid temperatures. Its design prevents the necessity of auxiliary valves, waste, pistons, packing and perishable diaphragms. The temperature of the liquid to be heated is the only force needed for its operation. This insures action which can be depended upon at all times and under all conditions—there are no uncertainties such as occur when a regulating mechanism depends upon



electricity, compressed air, or water to furnish its motive power. When most needed, these latter often fail, leaving the so-called regulator a mass of lifeless wheels, chains, trips and balanced weights. The Sylphon Tank Regulator obviates all this by employing forces resulting from changes in the temperature of liquids as the motive power. It is so simple and compact that the cost of putting it on a job is reduced to a figure hardly worth considering. It never runs down and it requires no attention.

The Sylphon Tank Regulator is entirely self-contained and depends upon no outside mechanism for its operation. The inventor in applying the Sylphon principle to liquid and air controllers and valves jumped into the very center of the field of heating needs, and then struck out boldly in a new direction. Mechanical simplicity and minimum number of parts make this invention one of the most important improvements of the century in heat regulation.

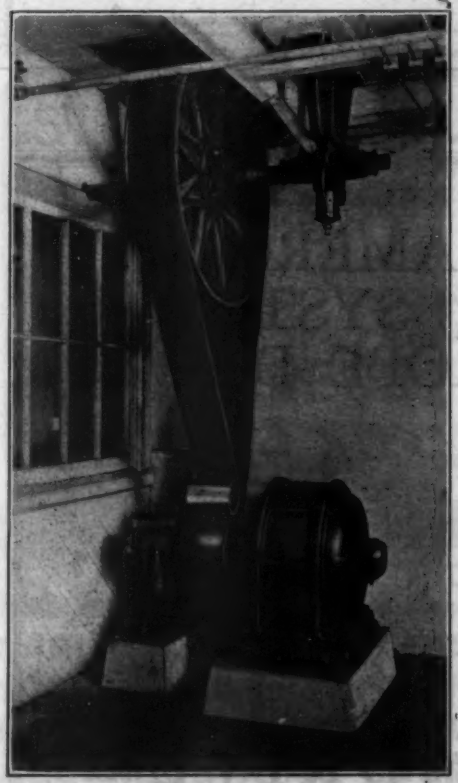
The Walter H. Bowes Company, manufacturers of the Dodge Gravitiy Evacuator, announce their removal from Port Chetser, N. Y., to 10 Hoyt street, Norwalk, Conn., where they will continue business along the same general lines as formerly.

The Consolidated Water Power & Paper Company has contracted for a new paper machine to trim 149-inch and to run at about 780 feet, with the Beloit Iron Works. The machine is to be installed at Grand Rapids, Wis., and be ready to run by October, 1920.

The LENIX Drive

¶ THE LENIX is a mechanical device scientifically applied to belt drives for the purpose of giving large arcs of contact between belt and pulleys, and automatically increasing or decreasing from such arcs in proportion to the variation in the power transmitted,

¶ THE LENIX prevents slippage yet permits of the elimination of 75 per cent of the initial tension universally found in belt drives. It gives absolute freedom in the relative location of the shafts and the ratio between the size of the pulleys. It saves in floor space, belting and power.



Write for
Descriptive Booklet
"Saving Slippage and Space"

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Engineers
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High Grade
Bleached
Sulphite Pulp

Furnished in Rolls—75% Air Dried or in Wet Laps

Write for Samples and Prices

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THE HILL CLUTCH CO.

AMERICAN SYSTEM ROPE DRIVES

Horizontal Tension Carriage

Everything from a small cast iron pulley to Complete Power Transmission Machinery Equipment for

Belt Rope DRIVE *Gear Chain*

THE HILL CLUTCH CO.
CLEVELAND, OHIO

Paper Handling Equipment

Paper mills are today paying a great deal of attention to the subject of industrial transportation.

Perhaps one reason for this is the scarcity and high price of unskilled labor. On the other hand, it may be that efforts to speed up production have caused them to give more attention to their inter-factory haulage.

While the transportation of raw and finished materials is but one item in production, it is an important one, and many companies have, therefore, speeded up their factory haulage by doing away with the slow and inefficient method of hand trucking and instituted the electric industrial truck.

To the surprise of those having adapted the electric industrial truck this equipment not alone speeded

up their haulage, but also did the work at half the former trucking costs, each truck taking the place of five to eight men.

The type of this equipment which has proven most popular in the various paper mills is the low platform style of machine equipped with a roll paper handling apparatus as shown on the photographs herewith attached.

Of course, in some instances tractors and other types of these machines have been adapted. It must be admitted every mill cannot use the same equipment with equal success. The conditions and layout of the plant is an important factor.

These trucks and tractors cost very little to operate, practically the entire expense being the cost to recharge the batteries, which averages about 60c per day, depending on the price paid for electricity per Kilowatt.

The proven, all-around efficiency of these labor-saving devices, which can operate anywhere a hand truck can go and take the place of five to eight hand trucks, have caused these machines to be very favorably considered by many progressive manufacturers, and we believe this is a subject that is worthy of investigation by all paper mill superintendents and officials.

Ash handling has been simplified in the plants of the Bryant Paper Company, Kalamazoo, Michigan.

AMERICAN
STEAM ASH CONVEYORS

are installed in all five of their mill power plants. The reason why is fully explained in catalogue P. Free on request.

American Steam Conveyor Corporation

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WE gave the artist this quotation, "No grimy, roily water for them," taken from Elbert Hubbard's new book recounting his recent little journey through Parchment. The artist's first conception was that we drank the water—but Bert found out that the pure sparkling stuff tests great! And is blown from fourteen wells by a hurricane of compressed air for paper making purposes.

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The Strength of Commercial Liquid Glues

Most of the commercial liquid glues are manufactured from the skins, heads, and swimming bladders of fish. Others are made by special treatment of the glue extracted from the hides, skins and bones of cattle; some for special uses are prepared from starch, from various natural gums, or from casein.

At the Forest Products Laboratory tests were made by B. A. P. inspectors on a number of these liquid glues, who found that they differ very widely in strength. Some of them are so weak as to be entirely unsuitable for woodworking purposes, while others compare favorably in strength with the "hot" glues. The glues tested varied from one which exerted a binding force of less than 50 lbs. per sq. in. to one with an adhesive strength sixty times as great, or more than 3,000 lbs. per sq. in.

Liquid glues may be tested by gluing together pairs of specially selected hard maple blocks, placing them in a testing machine, and measuring the force required to shear them apart. About 300 specimens, representing 26 different glues, have been tested in this way at the laboratory. According to the data thus obtained, a high grade liquid glue should have an average shearing strength of not less than 1,700 or 1,800 lbs. per sq. in.

In addition to uniform high adhesive strength, it is evident that certain other characteristics are desirable in a liquid glue. When spread upon wood surfaces, it should "set" and dry rapidly. In its container, it should remain fluid and workable at all ordinary temperatures. It should be elastic and shock-resistant. It should not be unusually susceptible to the action of high temperatures, high humidity, molds and bacteria.

The study gave evidence that the strength of liquid glue, like that of "hot" glue, depends largely upon its "body" or thickness, or, strictly speaking, upon its viscosity. Of 11 liquid glues examined, the thickest or most viscous glues showed the greatest adhesive strength.

Nitrocellulose from Wood Pulp

For over thirty years certain sporting powders have been derived in part from wood pulp, but only lately has there been any research looking toward the use of wood pulp in the production of cannon powder. The Forest Products Laboratory in recent experiments has succeeded in producing by all three pulping processes (the soda, sulphate, and sulphite) pulps which meet all surveillance tests for use in nitrocellulose manufacture. These pulps have been nitrated at the Picatinny Arsenal and run into powder of several calibers.

At certain steps in the process of manufacturing

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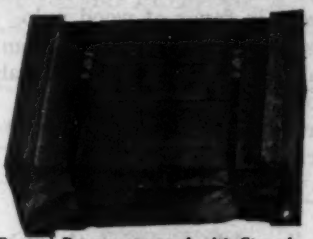

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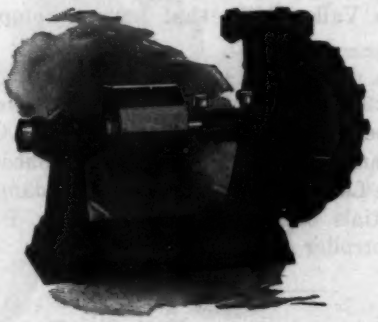

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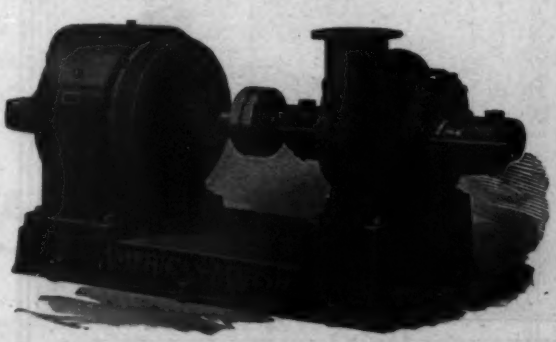

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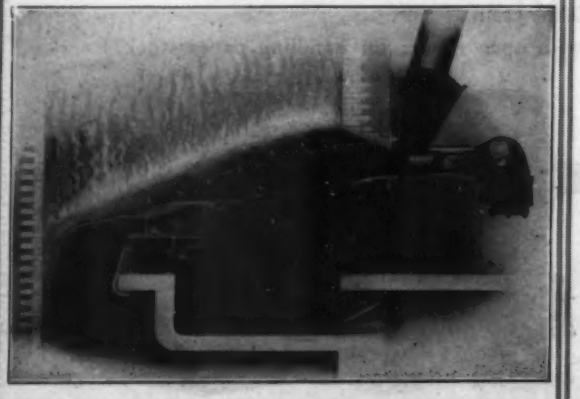

nitrocellulose, wood pulp can not be handled as easily as cotton, but at other points it yields to treatment more readily. On the whole, the differences in manufacturing are decidedly in favor of wood pulp. The yields are a little less than those obtained from cotton, but the material satisfactorily meets all laboratory tests for cannon powder.

Further work to reduce the cost of the wood-pulp product is now under way at the laboratory.

Kalamazoo Valley Meeting of the Cost Association

The Kalamazoo Valley Local Division of the Cost Association held its cost convention at the Park American Hotel, Kalamazoo, on Friday, Dec. 12, with a very large attendance. Every mill in the Kalamazoo district and many of the mills at a considerable distance from the Valley were represented and assisted in making the event a very successful one.

The opening address was made by President Geo. T. Jubb, auditor of the Kalamazoo Paper Co. The paper presented by Mr. S. L. Bush, manager of Research of the Crocker-McElwin Co. and the Chemical Paper Mfg. Co., was received with even more interest and enthusiasm than was shown at the Chicago meeting.

In addition to the address by Mr. Bush there were five tables exhibiting the various forms used in the paper industry: Table No. 1—Raw and Prepared Materials and Inventory Forms, Conversion Forms; Table No. 2—Finishing Forms, Departmental Burden Forms; Table No. 3—Statistical Forms, Copies of Cost Chart with Explanation; Table No. 4—Forms of Eastern Mfg. Co.; Table No. 5—The Forms from All the Kalamazoo Valley Mills that have a complete Cost System.

At 6:30 p. m. dinner was served. The meeting reconvened at 7:30 p. m. for the evening session, at which two papers were presented, "Benefit of Cost System from an Executive," by Norman Bardeen, manager of the Lee Paper Co., and "The Fundamentals and Essentials of Cost Accounting," by D. E. Burchell, Comptroller of the Eastern Mfg. Co.

Shake Arrangement for Cylinder Paper-Machines

A patent has been granted to Ernest W. Lindquist on a shake arrangement for cylinder paper-machines allowing the two claims asked:

1. Apparatus of the kind described comprising a pulp vat, a cylinder mold mounted to operate therein, and a grid mounted for reciprocation transverse of the plane of cylinder movement, said grid consisting in a plurality of rods with spaced apart strips extending from said rods and curving around a substantial

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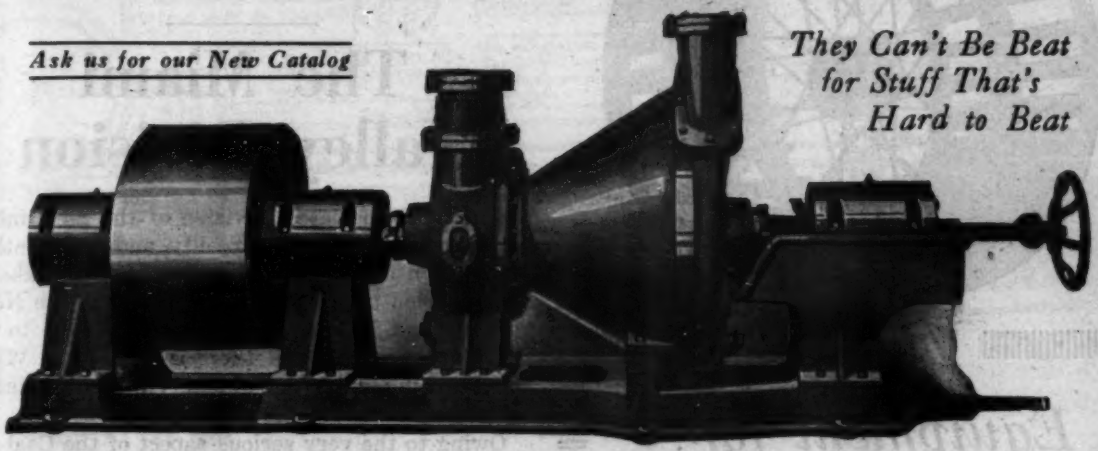

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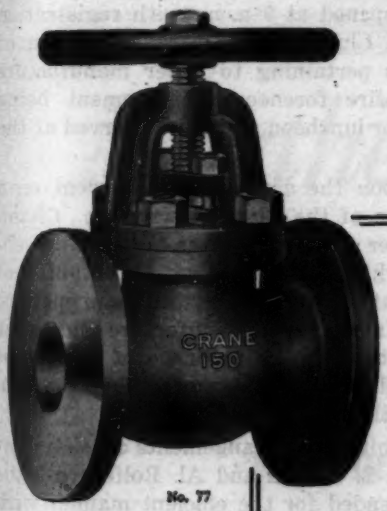

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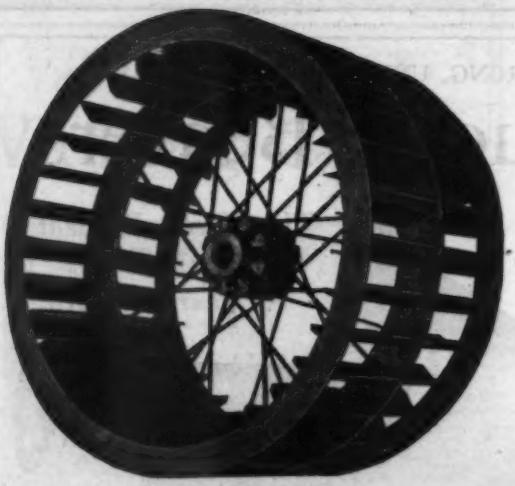
portion of the cylinder mold, said strips being relatively thin in the direction transverse of the cylinder, and substantially thicker in the direction of reciprocation whereby requisite rigidity thereof is attained along with the capability of passing through the pulp liquid without unduly agitating same.



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The Miami Valley Division

The third and latest division of the Superintendents' Association is now a reality, and if the enthusiasm shown at its initial meeting is to be taken as the criterion of its future development, the Northwestern and Michigan Divisions will have to step lively to keep up with the progressive "I WILL" spirit exhibited by the Miami Valley Superintendents.

Owing to the very serious aspect of the Coal situation in the middle west a large number of paper mills were confronted with a shutdown which, of course, prevented a larger number of superintendents from attending the meeting, but the deficiency in point of numbers was more than compensated for by the enthusiasm and the progressive spirit exhibited by those who did attend.

The meeting opened at 9 a. m. with registration at the Hamilton Club and a general discussion of important topics pertaining to paper manufacture occupied the entire forenoon, adjournment being taken at 12 m. for luncheon which was served at the Club.

In the afternoon the superintendents went on a tour of inspection of the Black-Clawson Co., Champion Coated Paper Co., and Hooven-Owens-Rentschler Co. plants which gave them an opportunity of seeing the very latest developments in steam engines, paper mill machinery, paper manufacture and paper mill management under the guidance of competent engineers to explain all of the newer phases of applied mechanics that were encountered.

The local committee of arrangements consisting of H. L. Kutter, T. S. Beeson and Al. Rolfe are to be especially commended for the efficient manner with which they handled affairs and for the many courtesies that they extended to the visitors to make their stay both pleasant and enjoyable.

The meeting reconvened at the Hamilton Club at 6:30 p. m., where dinner was served and the inauguration of the Miami Valley Division was brought to a successful conclusion by the nomination and election of temporary officers to act until the next regular meeting which will be held at the Hamilton Club, Hamilton, Ohio, on January 17, 1920, at 9 a. m. At this meeting permanent officers will be nominated

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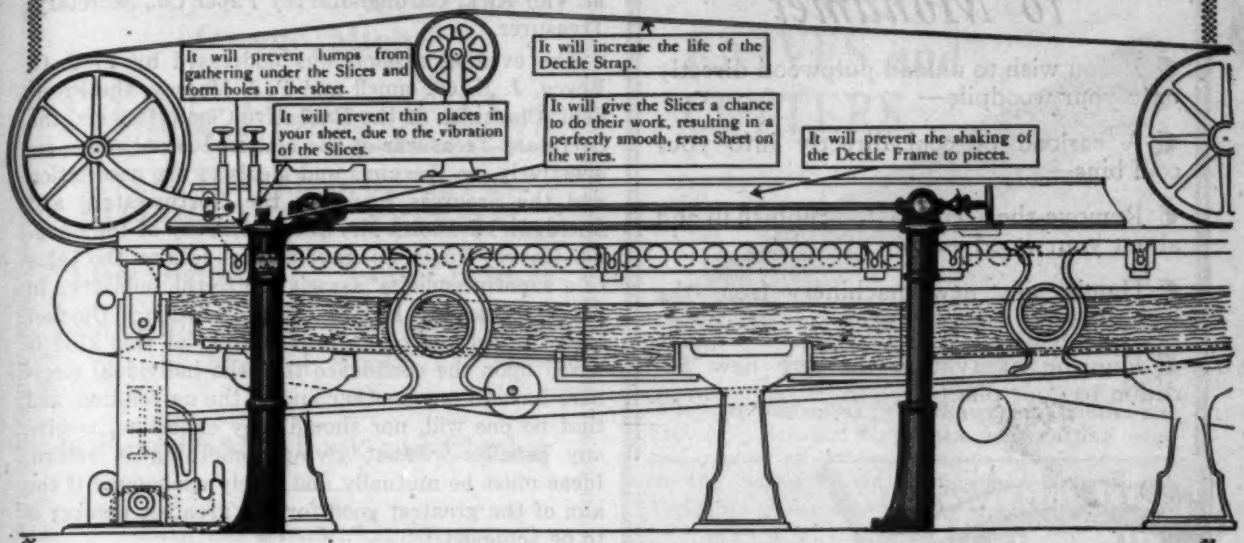
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and elected for one year and the various committees will be appointed. The temporary officers are A. O. Rolfe, Champion Coated Paper Co., Chairman; Max Zimmerman, Chas. Boldt Paper Co., Vice-Chairman; M. Van Kirk, Gardner-Harvey Paper Co., Secretary-Treasurer.

The evening session was addressed by Fred. C. Boyce, J. H. O'Connell and P. J. Massey, the President, Chairman of the Executive Committee and the Secretary-Treasurer of the National Association, respectively, on the aims and ideals of the association and the progress made by the Northwestern and Michigan Divisions. Mr. George Harvey of the Gardner-Harvey Paper Co. gave a short talk on the value of a superintendents' association to the industry. In his discourse, Mr. Harvey called attention to the fact that the success of an organization of this kind is based upon the confidence that the individual members have in one another and in the association, and that no one will, nor should they expect to, receive any benefits without giving something in return. Ideas must be mutually and freely exchanged if the aim of the greatest good for the greatest number is to be achieved.

Mr. Max Zimmerman spoke on the value of co-operation and Mr. Van Kirk gave as the reason for the assured success of the Miami Valley Division that it will be established upon mutual confidence and cooperation.

A paper on "Boiler Room Economy in the Paper Mill" was presented by Mr. J. F. Carrigan of the Carrigan Engineering Co., and after a lively discussion the meeting was adjourned.

If you are engaged as a paper or pulp mill superintendent in Ohio, Southern Illinois, Southern Indiana, you should make every effort to attend the next regular meeting of the Miami Valley Division at the Hamilton Club, Hamilton, Ohio, on January 17, 1920, at 9 a. m. However, make it your business to notify A. O. Rolfe, Champion Coated Paper Co., as to your intentions as soon as possible, in order to give sufficient time to make all the necessary arrangements for your reception.

Among those present at the meeting were Max Zimmerman, Chas. Boldt Paper Co.; W. R. Roehrer, Cincinnati; U. S. Dennison, Sandusky Foun. & Mch. Co.; C. C. Ulrich, Miami Valley Tissue Mills Co.; W. M. Benzing, Champion Fibre Co.; H. L. Kutter, Black-Clawson Co.; A. O. Rolfe, Champion Coated Paper Co.; A. F. Wilcox, U. S. Rubber Co.; T. S. Beeson, Hooven-Owens-Rentschler Co.; C. F. Trowbridge, Black-Clawson Co.; W. J. Schenk, Champion Coated Paper Co.; P. J. Massey, Secy.-Treas. Supts.' Assn.; J. W. Harbrecht, Hinde & Dauche Co.; C. H. Helvy, R. H. Burke, Chas. Dailey, Middletown, Ohio; H. W. Suter, Champion Coated Paper Co.; Jos. D. Reed, Jr.; Alex. Thompson, Logan Thompson; G. R. Shields; G. E. Glaser; C. R. Jamison; F. C. Cooke; R. J. Holman; L. T. Murphy, Au Glaize Paper Co.; R. J. Alli-

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son, A. A. Simonds & Sons Co.; P. G. Thompson; F. C. Boyce, Wausau Paper Mills Co.; E. B. Fritz, The Paper Industry; R. J. Gleason, Franklin Board and Paper Co.; J. F. Carrigan, Chicago; J. H. O'Connell, King Paper Co.; George Harvey, Gardner-Harvey Paper Co.

Meeting of the Michigan Division

The combined meeting of the Michigan Division of the American Pulp and Paper Mill Superintendents' Association and the Kalamazoo branch of the Cost Association of the Paper Industry was held at the Park-American Hotel on November 24, which proved to be one of the most successful gatherings in the history of the paper industry. The success of this first combined meeting is indicative of the splendid work that will be carried on during the coming winter months.

The addresses of the evening were delivered by W. R. Peebles on "Rubber Belting and What Can Be Expected of It," H. H. McClure on "Cost Finding and Accounting and Its Relation to Paper Mill Management," and Ray North, the editor of "Stub End," on the "Value of Paper Mill Executive Associations for Putting 'Busi' in 'Business'," which he delivered as usual in his own inimitable style.

Some very valuable discussions brought out the main points of the addresses and the very representative attendance was more than satisfied with this initial combined meeting. Among those who attended the meeting were the following:

G. W. Gerpheide, Bardeen Paper Co., Otsego.
Frank Gilchrist, Watervliet Paper Co., Watervliet.
Frank Scheid, Watervliet Paper Co., Watervliet.
Clarence Thorne, Watervliet Paper Co., Watervliet.
G. K. Ferguson, Watervliet Paper Co., Watervliet.
W. Brayten, Watervliet Paper Co., Watervliet.
George T. Jubb, Kalamazoo Paper Co., Kalamazoo.
Glen Ingling, Kalamazoo Paper Co., Kalamazoo.
Harry C. Bradford, King Paper Co., Kalamazoo.
Clare Crossby, King Paper Co., Kalamazoo.
G. S. Davis, King Paper Co., Kalamazoo.
C. A. Bradford, Rex Paper Co., Kalamazoo.
Ray Simpson, Bardeen Paper Co., Otsego.
Harry Spangler, Bardeen Paper Co., Otsego.
Harry Barney, Bardeen Paper Co., Otsego.
L. W. Russell, Wolverine Paper Co., Otsego.
H. M. Balgoyne, Wolverine Paper Co., Otsego.
Roy L. Strong, Lee Paper Co., Vicksburg.
W. J. Comstock, Lee Paper Co., Vicksburg.
J. T. Bacheldor, Standard Paper Co., Kalamazoo.
James B. Bacheldor, Standard Paper Co., Kalamazoo.
C. L. Fenstemaker, Hawthorne Paper Co., Kalamazoo.
Allen B. Milham, Bryant Paper Co., Kalamazoo.
Wm. Allen, Bryant Paper Co., Kalamazoo.
John Carter, Kalamazoo Vegetable Parchment Co., Kalamazoo.
Ralph Clark, Kalamazoo Vegetable Parchment Co., Kalamazoo.
A. D. Stauffer, Michigan Paper Co., Plainwell.
E. R. Snyder, Peninsular Paper Co., Ypsilanti.

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W. H. Scott, Kalamazoo Paper Co., Kalamazoo.
E. H. Usner, King Paper Co., Kalamazoo.
A. E. Endy, Wolverine Paper Co., Otsego.
N. M. Brisbois, Sutherland Paper Co., Kalamazoo.
E. H. Gilman, Bryant Paper Co., Kalamazoo.
L. A. Parker, Bryant Paper Co., Kalamazoo.
S. W. Simpson, Bardeen Paper Co., Otsego.
W. Wightman, Lee Paper Co., Vicksburg.
M. Redmond, Kalamazoo Paper Co., Kalamazoo.
C. W. Ulrich, Wolverine Paper Co., Otsego.
E. T. A. Coughlin, Monarch Paper Co., Kalamazoo.
G. H. Pountain, Monarch Paper Co., Kalamazoo.
J. H. O'Connell, King Paper Co., Kalamazoo.
Jake Kuss, King Paper Co., Kalamazoo.
A. G. Wightman, Hawthorne Paper Co., Kalamazoo.
Jacob Parent, Western Board & Paper Co., Kalamazoo.
W. J. Lawrence, Western Paper Makers' Chemical Co., Kalamazoo.
E. G. Milham, Bryant Paper Co., Kalamazoo.
Wm. Carroll, Bardeen Paper Co., Otsego.
D. S. Nesbit, Bardeen Paper Co., Otsego.
Charles Nobles, Lincoln Mills, Elkhart, Ind.
M. Wall, Standard Paper Co., Kalamazoo.
A. H. Parker, Bardeen Paper Co., Otsego.
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H. H. McClure, L. V. Estes, Inc.
Paul L. Broesamle, Monarch Paper Co., Kalamazoo.
C. V. Kean, Jr., Bardeen Paper Co., Otsego.

The next meeting of the Michigan Division will be held at the Park-American on Dec. 15, at 6:30 P. M.

Continued from page 756.

should realize that he is protecting the interests of his clients only by reasonable elimination of waste and he certainly can apply that to places where he uses lumber. I thank you. (Applause.)

If there are any questions I would be glad to answer them.

The President: Any questions you would like to ask Mr. Barth? Personally I have had experience with paper mill roofs, with all the different kinds of construction. I agree with him on paper mill roofs, but I do not agree with him on paper mill floors. I have worked on concrete floors myself for a good many years and where you have wood floors, especially in the machine room, beater room, places that he suggested, why there is always a little leak there, and the water is always dropping on the floor below and it is always keeping the whole place dirty and I haven't got any use for that at all. We ought to have a little discussion on this matter.

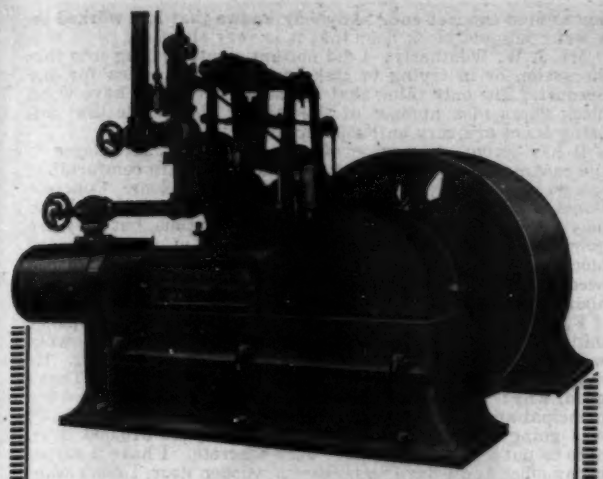
Mr. Barth: May I answer that? By the way, there is a wood block man in the room. You can waterproof your floor construction so that that dripping will not occur. Now, for instance, on the first floor, where you have a concrete foundation, as a rule that objection would not apply. You merely refer to second and higher floors. Now they can be waterproofed, Mr. Boyce. You can put a waterproofed coating underneath the blocks, before they are laid. If that condition were eliminated would you then be in favor of the wood block floor or the laminated, creosoted construction?

The President: You know, around a paper mill, especially in the machine room, you have a good many heavy weights and when the men take them off the trucks they do not set them down on the floor gently; they just drop them down. I have worked on wood floors. I know what they are when they are used. When they are new they are as good as could be desired, but they are not always that way. I think you are wrong on creosoted floors for the machine room, but I think you are perfectly right on paper mill roofs.

Mr. Barth: May I take refuge in the old saying of engineers that it depends sometimes upon conditions?

The President: Well, I would like to hear from any of the members of the association.

Mr. F. J. Milon: I think that the creosoted block is danger-



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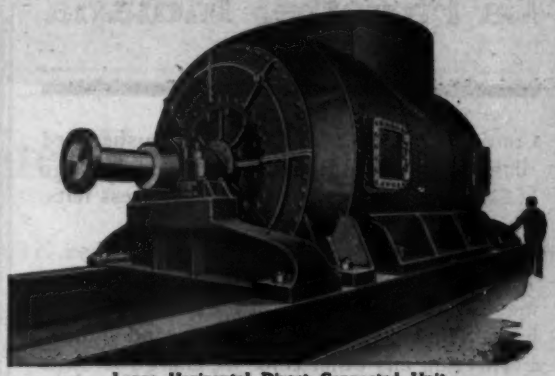

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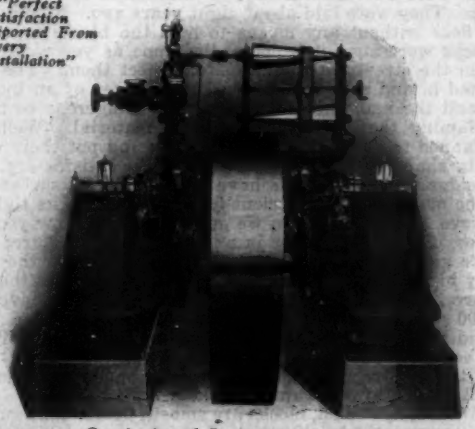

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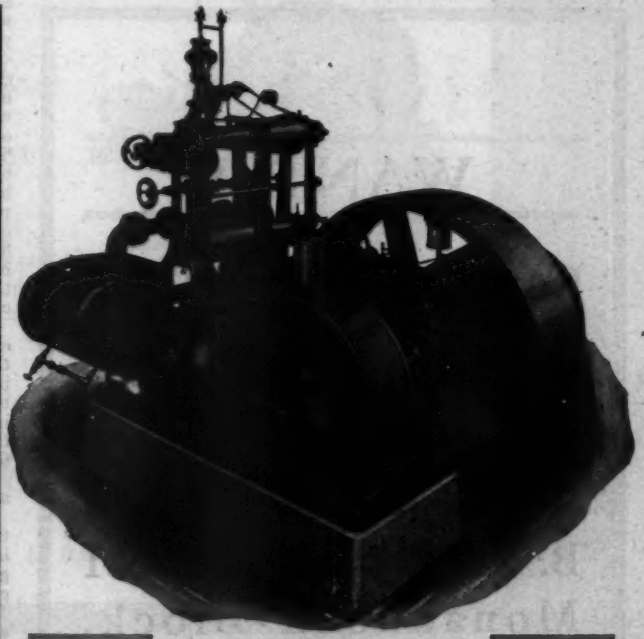

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ous around the wet end. Anybody knows that has worked on a wet creosoted block floor that it is very slippery.

Mr. J. W. Weatherly: I did not anticipate getting into this discussion or in trying to make any particular plea for our product. The only thing that I can say is that we have wood block floors in a number of the mills. The people that are using them are very enthusiastic about their floors.

It has become a question of labor conditions, Mr. Boyce to the contrary notwithstanding, that labor is more comfortable, can do more efficient work over a comfortable floor. Concrete is not a comfortable floor. The men may stand it, the men may not know the difference at the present time, but they are going to know the difference because the use of creosoted wood blocks in paper mills, as well as all the other industries has become the only efficient floor today and there is no doubt about it.

For instance, I was down in Peoria recently, not in a paper mill, but in a big washing machine plant, where the owner was requiring wood blocks for an additional mill building. He said, "I have to put this wood block floor in." I said, "That's good, why?" He said, "I had a strike here recently and my principal argument with my men was in showing them that I was going through for them, I said, 'I spent $10,000 down here to put a wood block floor over concrete. I have a carpet in my office and I have no need of a wooden floor, I don't want it, but I put them in for you to make you comfortable in showing you that I am spending money for your convenience; it means nothing to me personally.'" He says, "I have to put them into the new mill now because the men are going to insist upon it."

As for the water proofing in paper mills, we have the construction over tarred felt, with the use of the creosoted bituminous pitch, over this felt, and the wood blocks laid on this combination are absolutely waterproof and we will guarantee them as such.

Mr. Boyce speaks of abrasions by having materials dropped on wood block floors. We have them in Gary in the wheel shop there, the Illinois Steel, the American Bridge; we have them there where they drop anywhere from one hundred to one hundred and twenty-five pound castings on the blocks without material damage. That is one thing about the wood block floor, if the blocks do crack they keep their position, or if they crack too much they can be easily taken out in one particular place without changing the floor. They are the easiest to repair, the easiest to keep in condition. I think the wood block game has not been promoted properly so far in your paper mill district.

We had a case a while ago of the Kimberly-Clark mill, three or four weeks ago. They said that the wood block floors up there were not satisfactory. I wanted to see why, so I went up. They were laid about eight years ago. Simply laid on the floor without any means to hold the blocks together. The blocks were absolutely loose, the same as you would lay bricks in the street with nothing to protect them. The dirt had sifted in and raised those blocks a quarter of an inch in places and the man said that they were dangerous to truck over, blaming the construction on the material. Well, we have planned to go up there next Sunday and put their wood blocks in shape so that they are perfectly satisfactory. In their beater room the blocks have had wonderful success because the moisture was sufficient to keep those blocks tight.

I believe, gentlemen, when we get to you and show you the examples of wood block floor in mills that you will agree that they are going to be the paper mills' best floor, as they are in every big industrial plant that has been put up in the last two years. The Studebaker plant in South Bend have put in 92,000 square yards of creosoted blocks in their floor. The Olds and Ford and Buick and the whole bunch in Detroit are using them and you are going to use them.

Mr. Barth: Mr. Weatherly, somebody made a statement about danger. Do you want to make a reply?

Mr. Weatherly: Well, blocks are smooth floors. Any smooth floor is comparatively slippery. I think a wood block floor is less slippery than your concrete floor. Any smooth floor is going to be slippery under wet conditions. I don't think you can eliminate that.

Dr. Kress: There are a few points on which I would like some information. I recently had an opportunity to inspect a plant that had been shut down since the armistice was signed. The floor was creosoted wood blocks. I went into that plant and there were bulges in the floor. The plant had been shut down and the floor had raised up in numerous places, and I would like to know whether that was due to poor seasoning of the wood or what.

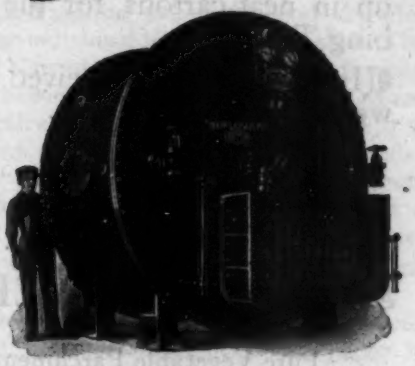
Mr. Weatherly: What was the condition? Was there a wet condition or any leakage there?

Dr. Kress: No, I don't think there was any leakage there.

(Continued in January Number)

"BUFLOVAK"

Recovery of Sulphite Waste Liquor



"Buflovak" Horizontal Tube Evaporator.

THE recovery of sulphite waste liquor from paper mills is one of the important fields developed through the "Buflovak" Vacuum Drum Dryer, which converts the liquor into a dry powder at a very low cost, thereby yielding a handsome profit. We will gladly send you details regarding the necessary equipment.

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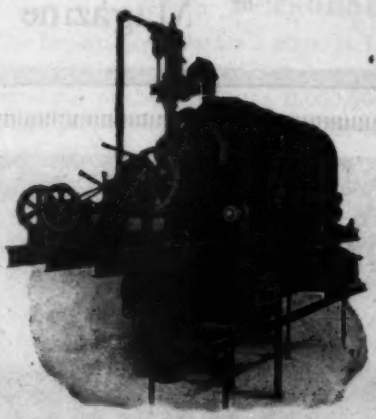

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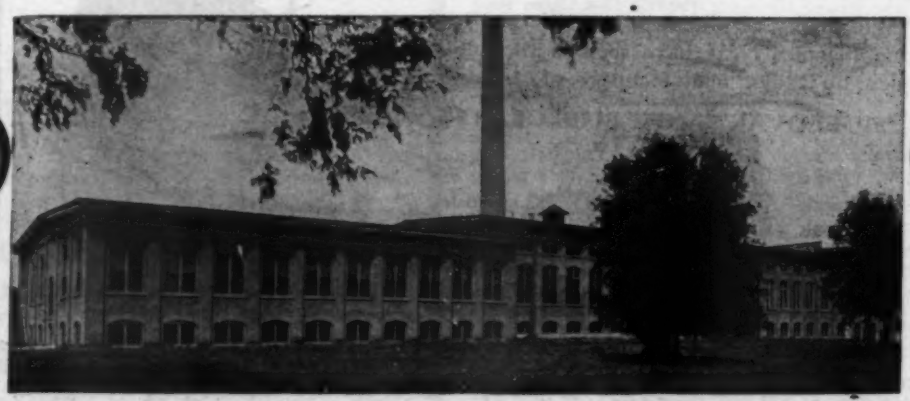

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"We are enclosing an order for two additional cars and think it would be well to add that your paper has been running very satisfactory and that it will probably be some little satisfaction to you to know that we are thoroughly satisfied with this sheet and think it well to give you a word of praise."

THE PRODUCTS OF INDIVIDUALITY

AS a general thing, December is a comparatively quiet period for the paper trade. The year-end slowing up of business activity which affects practically all lines of commercial endeavor makes itself felt in the paper industry the same as in other commodities, the holiday spirit cutting a wide swath and gaining precedence over the efforts of the average individual to transact business. There has been no sign of a lull in the demand for paper this month, however, and the market in its entirety is fully as active and as strong as it has been at any time in recent months. Consumers of all kinds of paper are virtually clamoring for supplies and manufacturers, though running their machinery at capacity, or at as full production as prevailing conditions will permit, are finding it just as difficult a matter to satisfy the wants of all their customers. In fact, it can be stated without fear of contradiction that demand for most descriptions of paper has broadened during the past few weeks rather than having eased off. Possibly this can be attributed in a measure to some mills having been compelled to decrease their production to a slight extent because of the shortage of fuel created by the coal miners' strike, which has made it necessary for certain consumers of paper to look in other directions for supplies. At any rate, the scope of demand has not lessened to any visible extent, and the continued heavy movement of paper and paper products into consuming channels is reflected by a very strong tone to market prices.

That consistent activity is scheduled for the industry for some time to come seems assured by the fact that the paper mills of the country, individually and collectively, are booked way ahead, many being sold up for so lengthy a period that they are refusing to enter into additional engagements. Irrespective of what business conditions develop after the turn of the year, it appears a foregone conclusion that paper manufacturers are going to have their hands fully occupied in filling even the orders they already have accepted. Moreover, there is a well defined belief throughout business circles that when the war is officially terminated by a declaration of peace, trade activity in all parts of America, and, for that matter, in all corners of the world, will at once expand, and it goes without saying that the paper industry in this country will share in this increased business to its full measure.

Market quotations on most kinds of paper are on the ascendency, with those on news print leading the advance. The news print situation is in a very tight condition. Reserve stocks have almost entirely disappeared and present consumption is of such volume that manufacturers are simply at a loss to cope with the demand. News in standard rolls for spot shipment has sold at beyond 8 cents a pound, while buyers freely bid in the neighborhood of 7.50 cents for prompt deliveries. Book papers also are in active demand and quotations have been advanced. With the printers' strike in New York ended, consumption in that locality has been resumed in the same volume as prior to the labor disturbance in the printing trade of the metropolis. Coarse papers are quotably firm and are moving in consistent fashion. Tissues find a ready market at strong prices. Cover and specialty papers are moving briskly at firm values. Quotations on boards have been advanced in many quarters as a result of demand exceeding the available supply.

News Personals

The Brown Corporation's plant at Lobin had a very serious fire which raged for several days and destroyed one of the mill units, 2,000,000 feet of lumber and 3,000 cords of pulpwood. The estimated loss is over $1,000,000.

The International Paper Co.'s plant at Niagara Falls, which has been idle since February, 1917, has started two machines on newspaper paper.

A large number of Chicago paper dealers were represented in the reorganization of the Foreign Trade Club, which is a part of the Chicago Association of Commerce. The Chicago Paper Company and the J. W. Butler Paper Company have been very active in this work. The club was organized several months ago on temporary lines to feel out the interest of local firms with reference to foreign trade. It was learned that the interest was much larger than had been commonly supposed, and the club has accordingly been organized along permanent lines.

Portable Machinery Co., Passaic, N. J., has just issued a circular entitled, "We Welcome Fair Competition," with reference to their scoop conveyor. It briefly describes how one concern has copied and is trying to market an imitation of their conveyor, and as there is a suit now pending for infringement of rights, the circular warns possible customers of portable conveyors against purchasing the imitation. Copies on request.

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Chemical and Mechanical Wood Pulp

IMPORT EXPORT

RAGS—PAPERSTOCK
ROPE—BAGGING
STRINGS

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¶ Our Daily Capacity is 300,000 pounds.

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IMPORTERS-DEALERS
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Rags, Bagging, Rope and Waste Paper
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SCREEN PLATES *and* DANDY ROLLS
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Papermaking Rags

Demand for practically all descriptions of papermaking material has broadened to quite an extent, and rags have figured in the increased trade activity to their full proportionate share. Consumers have placed a greater number of orders and individual transactions have involved larger amounts of stock, and values in the majority of instances have become enhanced under the heavier movement of supplies. New cuttings of nearly every sort have advanced in price and sharp rises in quotations on most grades of old rags have occurred. Increased demand from felt paper mills has been an outstanding feature, and prices on roofing rags are appreciably higher and still exhibit a strong upward tendency. Throughout the packing trade there is a well defined belief that a "boom" will develop in the rag market soon after the turn of the year. Opinion has it that paper manufacturers have a large volume of orders booked for paper which have not been covered in raw stock, and dealers look for a period of record-breaking buying activity following the holidays. Quotations are:

New Stock—	New York and Chicago
White shirt cuttings, No. 1	15.50-16.00
White shirt cuttings, No. 2	9.50- 9.75
Fancy shirt cuttings	11.00-11.25
Washables, No. 1	8.75- 9.00
Unbleached muslins	13.50-14.00
White lawns	13.75-14.25
Overall cuttings, blue	10.50-11.00
Black Silesias	6.50- 6.75
Old Stock—	
Whites, No. 1 repacked	8.50- 9.00
Whites, No. 2 repacked	5.50- 5.75
Whites, house soiled	3.75- 4.00
Whites, street soiled	3.25- 3.50
Thirds and blues, repacked	4.00- 4.25
Thirds and blues, rough	3.75- 4.00
Black stockings	3.20- 3.40
Lace curtains	7.00- 7.25
Cotton canvas, No. 1	5.00- 5.25
White cotton batting	5.00- 5.25
Roofing, No. 1	3.00- 3.25
Roofing, No. 2	2.90- 3.10

Rope and Bagging

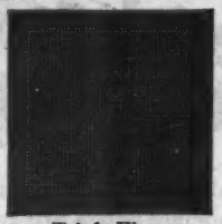
The reappearance in the market of several large buyers who previously had kept out of view for some time has strengthened the position and value of old rope and the situation for this commodity is marked by firmness. Sales of No. 1 Manila rope at 6.25 cents per pound at shipping points are reported, and only small supplies are available at cheaper figures. The market for bagging, on the other hand, is rather quiet. Occasional transactions involving fair-sized amounts of material are recorded but the aggregate movement into consuming channels is light and quotations are far from strong. Evidently the majority of consumers are obtaining large enough supplies from abroad to enable them to keep out of the domestic market as buyers to quite an extent. Prices follow:

	New York and Chicago
Gunny, No. 1 domestic	3.25-3.50
Gunny, No. 1 foreign	3.25-3.50
Scrap bagging, No. 1	2.75-3.00
Roofing bagging	2.30-2.40
Wool tares, heavy	3.50-3.75
Wool tares, light	3.25-3.50
Manila rope, No. 1 foreign	6.15-6.35
Manila rope, No. 1 domestic	6.15-6.35
Sisal strings	3.25-3.50
Mixed strings	2.50-2.75

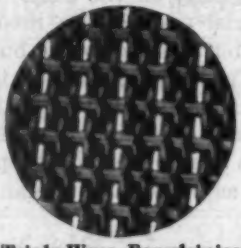
Old Papers

Waste paper of virtually every description is in good demand and prices display a strong tendency to advance notwithstanding the steady climb in values during the past few weeks. Consuming mills are buying in large volume, and, in their anxiety to cover requirements, are meeting most of the prices asked by dealers and packers, who in turn tell of having no little trouble in acquiring normal amounts of stock owing to the high cost of labor, which it is argued automatically diminishes collections, and to the economy being practiced by consumers of new paper all over the country. Probably the sharpest advance in prices has been in flat stock. The sudden return as buyers of large book paper manufacturers several weeks ago caused prices on old books and magazines to jump at a rapid pace, and values have been enhanced fully $8 to $10 a ton over the month. Shavings are quotably higher and are offered in rather sparse amounts, while kraft paper is scarce and held at high prices. Board mills are absorbing low grades in a consistent way and at firm quotations. White blank newspaper and overissue news are well nigh unobtainable in sizable tonnages, and current quotations on these two grades consequently are mainly nominal. Prices follow:

TYLER



Triple Warp Fourdrinier Wire



Triple Warp Fourdrinier Wire, Magnified Section

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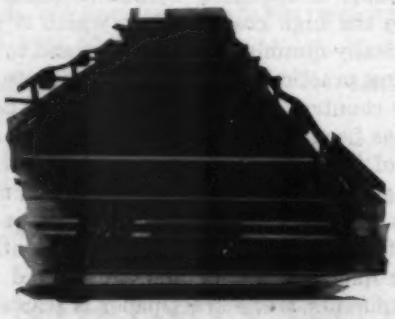
Triple Warp Fourdrinier Wires

The Tyler Triple Warp Fourdrinier Wires are made from phosphor bronze wire and are used for making finer grades of light weight paper, such as carbon, cigarette, high grade tissue, India and Bible papers, and other specialties.

As illustrated above, these wires are woven with a triple warp and a single shoot wire.

The triple warp wires can be woven to fit any paper-making machine, but are generally used on the smaller machines.

Prompt deliveries can be made on all meshes of Tyler Fourdrinier, Cylinder and Washer Wires. In many instances shipment can be made from stock, including the Tyler Special Wires and the regular No. 60, 65, 70, 75 and 80 Wires.



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Manufacturers of Fourdrinier Wires, Cylinder Faces, Washer Wires, Corduroy Cloth, Backing Wires

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Soft white shavings	4.40-4.60
Colored shavings	1.80-2.00
Heavy book, No. 1	2.35-2.50
Crumpled, No. 1	1.90-2.00
Ledger stock	2.60-2.80
Kraft, No. 1	3.35-3.50
Manilas, No. 1	1.50-1.60
White blank news	2.25-2.50
Overissue news, No. 1	1.35-1.50
Folded news	1.00-1.05
Mill wrappers	1.10-1.15
Box board cuttings	.90- .95
Mixed paper, No. 1	.85- .90
Common paper	.70- .75

News Personals

American paper manufacturers will have nothing to fear from competition from central Europe for at least five years to come, but will get it from England, is the opinion expressed by George A. Galliver, president of American Writing Paper Company, who has just returned from an extensive tour of Europe, where he made a study of conditions in the industry abroad. Mr. Galliver's trip covered the British Isles, France, Belgium, Holland, Germany, Switzerland and Czecho-Slovakia. Mr. Galliver is also a director of the American Paper Exports Company, and it is through the medium of this agency that American manufacturers are planning to increase their export business.

John Lindemann, for thirty years connected with F. Bredt & Company, papermakers' dyestuff dealers and importers at 240 Water street, New York, died on November 7 at his home in Brooklyn, N. Y.

Martin Spinelli, dealer in paper manufacturers supplies at 132 Nassau street, New York, has opened a branch office in Springfield, Mass., with Morris G. Tuck in charge. It is the intention of Mr. Spinelli to expand his business in new cotton cuttings, and with an office in the heart of the writing paper mill district of New England, he is provided with all the necessary facilities to properly and promptly fill the requirements of consumers of this class of rags in that part of the country.

Mr. Arthur Sjoholm, representing Elof Hansson, Gothenberg, Sweden, after a month's visit here during which time he called on many of the paper mills in the Central West, returns on December 6. While here, Mr. Sjoholm, through the efforts of Mr. Franklin I. Cobb, has made arrangements with F. Shalek, Inc., 103 Park avenue, to represent Elof Hansson and his pulp interests in the United States.

Julius H. Barnes, United States Wheat Director, together with associates, has purchased the majority stock of the Pejepscot Paper Company and its subsidiaries, formerly held by W. H. Parsons & Company and other stockholders, and it is understood that Mr. Barnes will head a company that will operate the Pejepscot properties when his duties as Wheat Director end next June. The Pejepscot Paper Company owns four lumber mills, two ground wood mills located at Pejepscot Mills and Topsham Mills, Me.; a chemical pulp mill at Lisbon Falls, Me., and three news print mills situated at Lisbon Falls, Brunswick and Pejepscot Mills, Me.

A new concern which has recently entered the New York trade is the Foreign Paper Mills, Inc., organized by H. Z. Schniewind, formerly New York representative of the Strathmore Paper Company. The corporation, which has established offices at 261 Broadway, New York, is capitalized at $100,000, and will conduct a general export and import business in various kinds of paper, selling to the jobbing trade.

Charles H. Sage, formerly manager of sales in Chicago for the Kimberly-Clark Paper Company, has assumed charge of the New York office of the company at 51 Chambers street. Mr. Sage is widely known in the West and his friends predict much success for him in his new field in the East.

HOWARD BOND
WATERMARKED
Color Brilliant
Strength Wonderful
The HOWARD
Paper Company
Urbana, Ohio

PAPER RAGS

SAVE MONEY

Consult a Specialist for Your Requirements Who Can Supply Your Demand

MARTIN SPINELLI
Paper Manufacturers' Supplies
132 NASSAU STREET NEW YORK

Wire at my Expense for Quotations on 100 or 1000 Tons for Quick Deliveries

BAGGING ROPE

J. ANDERSEN & CO.

FREDERICK BERTUCH, SPECIAL PARTNER
21 East 40th Street, New York City

Importers of Chemical Pulps
BLEACHED AND UNBLEACHED

Agents for Kellner Partington Paper Pulp Co., Ltd.
Sarpsborg, Norway; Forshaga, and Edsvalla, Sweden;
Bergvik and Ala Nya Aktiebolag, Söderham, Sweden

PRICE & PIERCE, Ltd.

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Bathurst, N. B.
EASY BLEACHING SULPHITE AND KRAFT PULP
Also
ATLANTIC PAPER & PULP CORP.
Savannah, Ga.
KRAFT PULP

Phones 8311 8312 8313 Murray Hill

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50 East 42nd Street
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Importers and Exporters of
CHEMICAL WOOD PULP
of ALL KINDS

Dealers in
Domestic Sulphites, Kraft Pulps and GROUND WOOD

Agents for PAPER MILL SUPPLIES

New Papers

Writing—	
White rag	20-40
White sulphite, No. 1	12-20
Colored	14-23
Ledger—	
White rag	20-42
White sulphite	14-22
Colored sulphite	16-
Colored rag	22-
Bonds—	
White rag	17-47
White sulphite	13-22
Colored sulphite	14-26
Colored rag	17-50
Book—	
No. 1 S. & S. C.	9.50-10.00
Machine finished	9.00- 9.50
English finished	10.00-12.00
Coated and enamel	11.00-14.00
Lithograph, M. F.	9.25-12.00
News Print—	
Rolls, contract	3.75-
Rolls, transient	7.50- 8.00
Sheets	7.00- 7.50
Side runs	5.50- 6.00
Cover Stock—	
Coated, both sides	12.25-
Coated, one side	12.20-
Wrappings—	
No. 1 kraft	8.50- 9.00
No. 2 kraft	7.75- 8.25
Boards—	New York and Chicago
Solid news	65.00-70.00
Straw	55.00-65.00
Plain chip	60.00-65.00
White coated chip	75.00-80.00
Manila coated chip	70.00-75.00
Binders board	75.00-80.00

Chemical Pulp

Quotations on chemical wood pulp are steady and a good consistent business is reported in all corners of the trade. Paper manufacturers are buying conservatively, generally confining their operations in the market to tonnages directly required, but the average consumer of chemical pulp is encountering such a brisk demand for his product that he is running his plant at maximum capacity and is frequently finding it necessary to augment contract supplies of raw material, with the obvious consequence that there is a persistent and comparatively large demand for pulps of all kinds. Offerings of spot and forward shipments, therefore, are readily absorbed and buyers are unhesitatingly meeting the prices asked. Sulphites are in particularly good demand and most of the reports heard are to the effect that consumers' supplies are short and that they are experiencing difficulty in locating all the pulp desired. Unbleached sulphite of news print quality is selling at 3.50 to 3.75 cents a pound at pulp mills, domestic easy bleaching sulphite at 4.50 to 5 cents and bleached sulphite of No. 1 standard grade at 6 cents and higher. Mitscherlich sulphite is eagerly sought and is scarce. Kraft is moving in good volume. Quotations f. o. b. mills are:

Bleached sulphite	6.00-6.50
Easy bleaching sulphite	4.50-5.00
News grade sulphite	3.50-3.75
Soda pulp, bleached	4.50-5.00
Mitscherlich unbleached	5.50-5.75
Kraft, No. 1	3.75-4.00
Screenings, refined	1.75-2.00

Mechanical Pulp

Extreme firmness characterizes the tone of the ground wood market and offered supplies are decidedly inadequate to satisfy the wants of buyers. Manufacturers in various parts of the country are contracted ahead and have few sizable lots of pulp to divert to the open market, with the result transient purchasers are having much trouble in finding available supplies while even regular customers of grinding mills are failing to get all the ground wood wanted. Quotations range from $50 to $55 per ton at shipping points for spruce pulp of No. 1 quality, freshly ground, and actual sales are reported to have been made in some instances at $60. Considering the heavy consumption of ground wood, the low level of reserve stocks, and the favorable indications for a continuance of the voluminous demand for news print paper, it would seem that mechanical pulp will be provided with a strong market for some time.

Chemicals

Pulp and papermaking chemicals are quotably firm and are moving in concerted fashion, demand from consuming and export quarters being of a healthy

F. G. MARQUARDT, President
HUGO THUM, Vice-Pres. CHAS. E. RAND, Secy.
A. D. LORENZ, Treasurer

F. G. Marquardt, Inc.

PAPER

and

Paper Makers' Supplies

345 Broadway, New York City

Packing House
ROCKVILLE CENTRE
NEW YORK

Special Attention Called to Our Own Packing and Assortment

White's

Chipper Knives

DO THIS—TRY ONE SET
to see for yourself—
You'll Not Be Sorry.

The L. & I. J. White Co.
85 Columbia Street BUFFALO, N. Y.

Reasons for using our domestic

Washed Clay

QUANTITY: Largest production in United States.

QUALITY: Lowest grit and moisture contents of any clay, domestic or foreign.

DELIVERIES: Reserve stock never under 6000 tons.

PLANTS: Three huge plants at McIntyre, Ga., under direct control of Edgar Bros. Co., also Saylorsburg, Pa., and Gordon, Ga.

CRUDE CLAY: Paragon and Excelsior Brands.

MINER-EDGAR CO.
30 Church St. New York

N.O.C. N.O.C.
NEW YORK OVERSEA CO. Inc.
Importers and Exporters of
WOOD PULP and PAPER
Offices located all over the World
New York Christiania
Stockholm Teneriffe
Copenhagen Maranham
London Rio de Janeiro
Paris Sao Paulo
Marseilles Buenos Aires
Genoa Hong-Kong
San Francisco Shanghai
Las Palmas Tientsin
Calcutta Batavia
Samarang Durban
Surabaya Cape Town
Valparaiso
NEW YORK 17 BATTERY PL. U.S.A.
N.O.C. N.O.C.

character and of sufficiently broad dimensions to keep producers busily engaged. Latest quotations follow:

Alum, lump ammonia	4.00- 4.25
Alum, lump starch	8.25- 8.50
Alum, powdered	4.25- 4.50
Blanc fixe	4.25- 4.50
Bleaching powder (domestic drums)	2.25- 2.50
Brimstone (ton)	18.00-20.00
Casein	13.00-15.00
Caustic soda	3.00- 3.25
China clay, domestic, washed	11.00-12.00
China clay, foreign	15.00-20.00
Rosin, grade E	17.00-17.10
Satin white	2.25- 2.50
Soda ash, 58 per cent light (bags)	1.90- 2.00
Sulphite of alumina, commercial grade	1.75- 2.00
Starch, Globe, in bags	5.87-
Talc (ton)	12.00-15.00

News Personals

The National Wax and Paper Manufacturing Company, of Bush Terminal, Brooklyn, N. Y., has opened an office in the Hearst Building, Chicago, with Messrs. Middleton and Ullman in charge.

The Main Paper Stock Company, extensive packers of papermakers' supplies of all descriptions at 25-31 Peck Slip, New York, has increased its capital stock from $30,000 to $100,000.

J. M. Sexsmith, formerly assistant secretary and treasurer of the St. Regis Paper Company, Watertown, N. Y., is now associated with the Craig-Becker Company, wood pulp importers and dealers, of 52 Vanderbilt avenue, New York.

The Hercules Paper Corporation, of New York, has been organized and incorporated with a capital of $100,000 to operate two paper mills which have already been acquired by the company and others which it intends to purchase or construct. Officers of the corporation are: President, Charles C. Walsey, vice president of the Climax Stationery Company, manufacturing stationers of 29 Sullivan street, New York; Vice President, Max Halz, of Josephthal & Co., New York bankers; Treasurer, Nicholas J. Gerold, also of Josephthal & Co., and Secretary and Assistant Treasurer, J. H. Curtin, who served as Assistant Chief of the General Supplies Division of the War Department during the war. The company has purchased the mill at Cornwall-on-the-Hudson formerly operated by the Storm King Paper Company, and the paper mill previously owned by the Big Falls Paper Company at Rock City Falls, N. Y. The Cornwall plant is now running on news print and the Rock City Falls mill on box board and board specialties.

The Chicago Evening Post has purchased the Watab Pulp & Paper Company at Sartell, Minn., and will increase the news print output of the mill.

Salomon Bros. & Co.

Importers of

All Grades of Rags and Paper Stock

200 Fifth Avenue, NEW YORK

Cotton Waste Linters Ramie

WANTED!

12 or 15 Second Hand

Cylinder Driers

(48" or 36" diam. by 57" face.)

Send price and full particulars to

Bird & Son, Inc., E. Walpole, Mass.

OXFORD PAPER CO.

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The Pulp and Paper Trading Co.

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Dealers in Domestic Chemical and Mechanical Pulps and Paper

AGENTS FOR
J. & J. Rogers Company, Au Sable Forks, N. Y.
Canadian Kraft, Ltd.
Dealers in Wayagamack Kraft
Three Rivers, Canada

EASTERN AGENTS FOR
Port Huron, Michigan, Mitscherlich Sulphite
Made by Port Huron Sulphite & Paper Co., Port Huron, Mich.

AMERICAN TRANSMARINE CO., INC.

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PAPER and WOOD PULP

RYDÖ STRONG SWEDISH UNBLEACHED SULPHITE IN STOCK

E. J. KELLER COMPANY

INCORPORATED

200 FIFTH AVENUE

NEW YORK

FOREIGN AND DOMESTIC

PAPER MAKERS' SUPPLIES
COTTON, JUTE AND FLAX WASTES
COTTON BAGGING MATERIALS
EAST INDIA MERCHANDISE

Hart Trading Co. Inc.

Tribune Building, New York

PAPER MILL AGENTS

EXPORTERS and IMPORTERS

PAPER PULP

BRANCH OFFICES

Chicago Rio de Janeiro Buenos Aires Valparaiso

The Stickle Automatic Steam Control for Paper Machines

WE wish to emphasize the word "automatic." This with us means that the steam follows changes that come to the sheet from free to hard drying stock or any ordinary changes in weights. A control that does not do this in itself is not automatic. This makes a better sheet of paper. We guarantee to hold the moisture at any point you wish with ½ of 1% change. Furnished on 60 days' approval.

OPEN COIL HEATER & PURIFIER CO.

INDIANAPOLIS, IND.

BOSTON PHILADELPHIA

30 Years Exporting American Paper

Our Markets: The World outside of U. S. A. and Canada.

Our Organization: Ten selling offices, besides salaried travellers and local representatives.

Our Demand: An established clientele, constantly being increased, by an aggressive sales policy.

Our Supply: **Your Mill?**

Present conditions in America are temporary.

Have you considered what a first-class export outlet would mean to you, with its assurance of **steady** demand?

Parsons Trading Company

17 Battery Place
NEW YORK

London Bombay
Stockholm Mexico, D. F.
Sydney Havana
Melbourne Buenos Aires
Wellington Rio de Janeiro

Chemical Pulp

Advices from Scandinavia say that wood pulp mills in both Norway and Sweden are sold up for several months and that prices are on the rise, buyers in consequence encountering increased difficulty in acquiring fresh supplies and being obliged to pay higher prices. The Baltic is reported closed for the season and current shipments are of pulp from Norway and the west coast of Sweden or of pulp sent across country from Swedish east coast mills. Arrivals here continue small, importations being no more than a quarter of the average tonnage received in prewar times, and such lots as are coming in have mostly been bought for arrival and therefore have little or no influence on the market in the United States. Receipts at New York during the past month and latest quotations are:

Bleached sulphite	$7.50-8.00
Unbleached sulphite, No. 1	4.75-5.00
Easy bleaching	5.25-5.50
Mitscherlich unbleached	5.75-6.00
Kraft	4.00-4.25

American Woodpulp Corp., 9,107 bls. from Gothenburg; Nilsen, Rantoûl & Co., 3,000 bls. from Gothenburg; National Bank of Commerce, 4,300 bls. from Gothenburg; Scandinavian-American Trading Co., 730 bls. from Gothenburg; M. Gottesman & Co., 2,500 bls. from Christiania, 125 bls. from Gothenburg; J. Anderson & Co., 12,234 bls. from Christiania, 1,200 bls. from Gothenburg; A. J. Pagel & Co., 600 bls. from Christiania; Barrow, Wade, Guthrie & Co., 880 bls. from Heart's Content; Order, 2,310 bls. from Gothenburg.

Paper Stock

Importation of papermaking rags show little diminishment, supplies from various European sources continuing to come in in large quantities. A good proportion of the foreign material is the property of mills when it arrives here, quite a number of paper manufacturers having representatives on the other side buying stock, but dealers report encountering no trouble in marketing the bulk of supply they are bringing in. The chief complaint registered by importers is over the conditions prevailing around the docks at New York, the congestion being so bad that long delays are experienced in effecting shipments from steamers to consuming points. Quotations on most grades of foreign rags, rope and bagging are steady and firm, although in some instances dealers are shading prices to dispose of certain parcels of material. Arrivals at the port of New York within the past month follow:

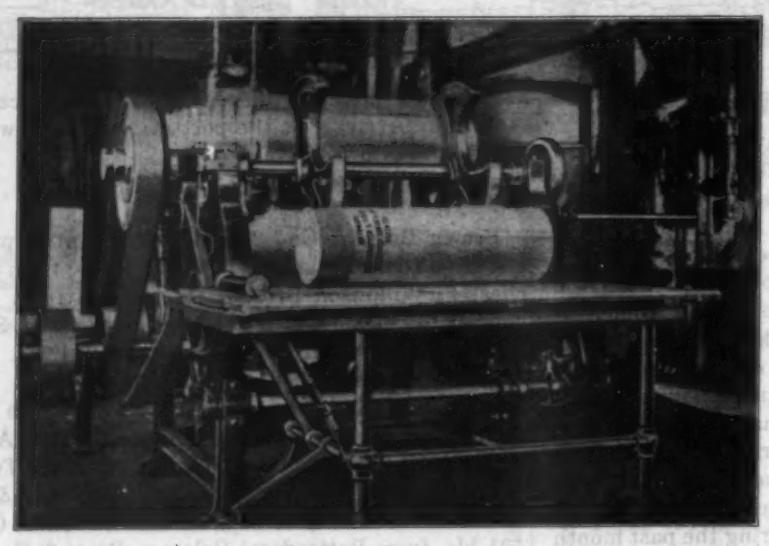
Rags

Brown Bros. & Co., 854 bls. from Antwerp, 124 bls. from Glasgow; A. Katzenstein, 30 bls. from Manchester; Wilkinson Bros. & Co., 60 bls. from Manchester, 17 bls. from Hull; British Bank of South America, 185 bls. from Manchester, 244 bls. from Antwerp; Guaranty Trust Co., 51 bls. from Manchester, 179 bls. from London, 562 bls. from Antwerp; T. J. Hyman, 368 bls. from Antwerp; Albion Trading Co., 774 bls. from London; Davies, Turner & Co., 26 bls. from Antwerp; R. F. Downing & Co., 155 bls. from London; Certain-Teed Products Corp., 101 bls. from Rotterdam; Salomon Bros. & Co., 354 bls. from Rotterdam, 25 bls. from Hull; William Hughes & Co., 174 bls. from Rotterdam; Smith Paper Co., 129 bls. from Hull, 75 bls. from Tarragona; Goldman, Sachs & Co., 171 bls. from Hull, 52 bls. from Bordeaux; Sanderson & Son, 446 bls, from Hull; Equitable Trust Co., 22 bls. from Leith, 265 bls. from Havre, 580 bls. from Bordeaux, 604 bls. from Hull; Irving National Bank, 43 bls. from Leith; Standard Bank of South America, 269 bls. from Leith, 163 bls. from London; American Express Co., 102 bls. from London; Kidder, Peabody & Co., 284 bls. from Havre, 75 bls. from Bordeaux, 112 bls. from Hull; Maurice O'Meara Co., 94 bls. from Havre; Jebb Bros., 60 bls. from Havre; National City Bank, 36 bls. from Havre, 70 bls. from London; Arrowhead Mills, 65 bls. from London; Castle, Gottheil & Overton, 477 bls. from Rotterdam, 438 bls. from Bordeaux; George W. Millar & Co., 205 bls. from Rotterdam; E. J. Keller Co., 138 bls. from Rotterdam, 98 bls. from Hull; F. W. Bird & Son, 87 bls. from Rotterdam, 93 bls. from Hull; Frank & Berg, 109 bls. from Rotterdam; Atlantic National Bank, 229 bls. from Bordeaux; Edwin Butterworth & Co., 24 bls. from Hull; Berman Bros., 14 bls. from Hull; B. D. Kaplin & Co., 22 bls. from Hull; A. Salomon, Inc., 271 bls. from Hull; Order, 611 bls. from Antwerp, 536 bls. from Hull, 1,120 bls. from Havre, 2,083 bls. from Bordeaux.

Old Rope

National City Bank, 111 bls. from London; Brown Bros. & Co., 137 coils from Christiania, 47 bls. from Marseilles, 403 coils from Bristol, 125 bls. from Havre, 298 coils from Hull, 87 bls. from Leith; Upson, Walton & Co., 40 coils from Liverpool; Castle, Gottheil & Overton, 210 coils from London; Foreign Trade

EFFICIENCY IN WRAPPING ROLLS



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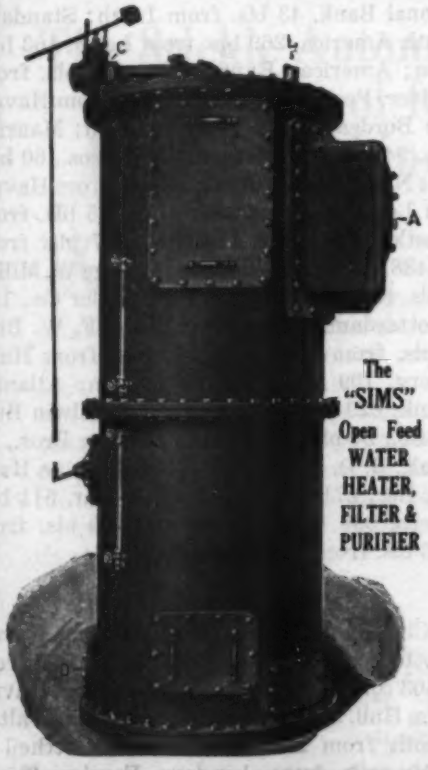
Power Roll Wrapper

Wraps and stencils Rolls at a saving of from fifty to seventy-five per cent.

Nekoosa Motor & Machine Company

Manufacturers and Sole Agents

NEKOOSA, WIS., U.S.A.



The "SIMS" Open Feed WATER HEATER, FILTER & PURIFIER

WHEN you buy a water heater, or anything else for that matter, you do not actually buy a water heater, but what it will do.

"SIMS" Open Feed Water Heater, Filter and Purifier is the product of Modern Engineering Science and has met the demand for greater efficiency.

OPEN FEED construction is the most simple and effective principle of feed water heating and has less maintenance troubles and operating costs than any other type.

WATER HEATER feeds your boilers with hot water, reduces the strain from contraction and expansion due to feeding cold water and effects a saving of approximately 14.5% in fuel.

FILTER and PURIFIER the feed water in a filtering chamber containing hard coke of suitable size as the filtering medium.

Water containing earthy matter and carbonate of lime when heated close to the boiling point is thrown out of solution into suspension and is removed by the filter.

Is installed you GET the service you bought

Ask us about the "Sims" feed-water heaters.

THE SIMS COMPANY

"We Keep Others in Hot Water."

ERIE PENNA.

Banking Corp., 109 coils from Rotterdam; Equitable Trust Co., 381 coils from Hull; Edwin Butterworth & Co., 230 coils from Hull; W. Schall & Co., 196 coils from Hull; International Purchasing Co., 618 coils from Hull; Wilkinson Bros. & Co., 133 coils from Hull, 88 coils from Leith; Old Colony Trust Co., 56 bls. from Havre, 195 bls. from Hull; J. Oppenheimer & Co., 50 bls. from Bordeaux; Salomon Bros. & Co., 568 coils from Hull; Ladenburg, Thalman & Co., 230 coils from Hull; Order, 70 coils from Antwerp.

Old Bagging

Castle, Gottheil & Overton, 77 bls. from Glasgow, 565 bls. from London; Mechanics & Metals National Bank, 116 bls. from Manchester; L. H. Abenheimer, 95 bls. from Manchester; Adams Bag Co., 105 bls. from Antwerp; E. J. Keller Co., 246 bls. from Oporto; Irving National Bank, 147 bls. from Leith; Credit Comml. de France, 226 bls. from Hull; National City Bank, 190 bls. from Hull; Order, 307 bls. from Antwerp, 421 bls. from Hull.

Paper Stock

Equitable Trust Co., 165 bls. from Glasgow, 321 bls. from Havre, 512 bls. from Hull; Irving National Bank, 67 bls. from Glasgow; Brown Bros. & Co., 684 bls. from Havre; Credit Comml. de France, 153 bls. from Havre; New Netherlands Bank, 432 bls. from Havre; Castle, Gottheil & Overton, 39 bls. from Liverpool, 994 bls. from Rotterdam; R. F. Downing & Co., 871 bls. from Rotterdam, 67 bls. from Tarragona; National Bank of Cleveland, 118 bls. from Rotterdam; George W. Millar & Co., 110 bls. from Rotterdam, 310 bls. from Dundee; E. J. Keller Co., 230 bls. from Rotterdam, 120 bls. from Dundee; Northern Metal Co., 81 bls. from Rotterdam; National City Bank, 70 bls. from Dundee; Maurice O'Meara Co., 120 bls. from Dundee; Salomon Bros. & Co., 158 bls. from Dundee.

Paper

Cigarette paper from France constitutes the major portion of the supply of paper now being imported into the United States. Occasional shipments of filter, hanging and special printing papers also are being received, but aside from cigarette paper, present importations are of a negligible quantity. Arrivals at New York during the past month follow:

Cigarette

B. E. Teale, 50 cs. from Oporto, 37 cs. from Marseilles; Surbrug Co., 20 cs. from Southampton; A. Orlik, 25 cs. from Rotterdam; American Tobacco Co., 245 cs. from Havre, 1,340 cs. from Bordeaux, 2 cs. from Kingston; Bernard, Judae & Co., 5 cs. from Havre; Rose & Frank, 18 cs. from Havre; Boucher Cork & Machine Co., 3 cs. from Bordeaux; Guaranty Trust Co., 58 cs. from Bordeaux; A. P. O'Brien, 62 cs. from Bordeaux; F. Harris, 8 cs. from Bordeaux; Equitable Trust Co., 1,010 cs. from Bordeaux.

Hanging

W. H. S. Lloyd & Co., 15 pkgs. from London, 5 cs. from Liverpool; F. L. Kramer & Co., 15 bls. from Liverpool; Prager Co., 776 bls. from Rotterdam; Order, 33 bls. from London.

Filter

Lunham & Moore, 7 cs. from London; H. Kaiser Sons, 41 bls. from Havre; E. Fougera & Co., 104 cs. from Bordeaux; J. Manheimer, 60 bls. from Bordeaux; R. U. Delapenka & Co., 10 cs. from Marseilles; American Express Co., 134 cs. from Bordeaux.

Printing

B. F. Drakenfeld & Co., 19 cs. from Liverpool.

Tissue

Davies, Turner & Co., 15 pkgs. from Liverpool.

Miscellaneous

C. B. Richard & Co., 2 cs. from Hamburg; Prager Co., 795 Bls. from Rotterdam; B. F. Drakenfeld & Co., 14 cs. from Liverpool; G. E. Stechert & Co., 6 bls. from Liverpool; Parsons & Whittemore, 248 bls. from Glasgow; D. L. Ward & Co., 20 cs. from Genoa; Tokstad Co., 6 cs. from Bergen; American Express Co., 30 cs. from Marseilles; Emmerick & Co., 2 bls. from Havre; R. F. Downing & Co., 13 cs. from Hamburg; Bendix Paper Co., 25 bls. from Hamburg; National City Bank, 60 bls. from Hamburg; H. Koblenzer, 3 cs. from Hamburg; A. H. Ringk & Co., 20 cs. from Hamburg; H. Kaiser & Sons, 19 bls. from Havre; Lunham & Moore, 39 cs. from London; P. C. Kuyper & Co., 2 cs. from Southampton; Wilkinson Bros. & Co., 32 rolls from Gothenburg; Barrow, Wade, Guthrie & Co., 6,085 rolls from Heart's Content; Black, Starr & Frost, 3 cs. from Havre; Campert & Sons, 2 cs. from Havre; H. D. Catty & Co., 2 cs. from Havre.

News Personals

The feed water heater is worthy of close attention. A simple change of tubes in one instance resulted in an increase of 20° in the temperature of the boiler feed water. The heat which is responsible for this increased temperature formerly went to waste. Sometimes it pays to run the exhaust steam into condensers, thus getting the last ounce of power out of it. With some types of condensers this condensed water may then be used for boiler feed.

The McAlear Manufacturing Company, 1901-07 South Western Avenue, Chicago, Ill., announces removal to their new factory, located at the above address, where they will manufacture and market a complete line of power and heating specialties.

Every bit of clean condensation or other water which still contains heat will, if fed back to the boilers, reduce the drain upon the coal pile.

Holyoke Machine Co. HOLYOKE MASS.

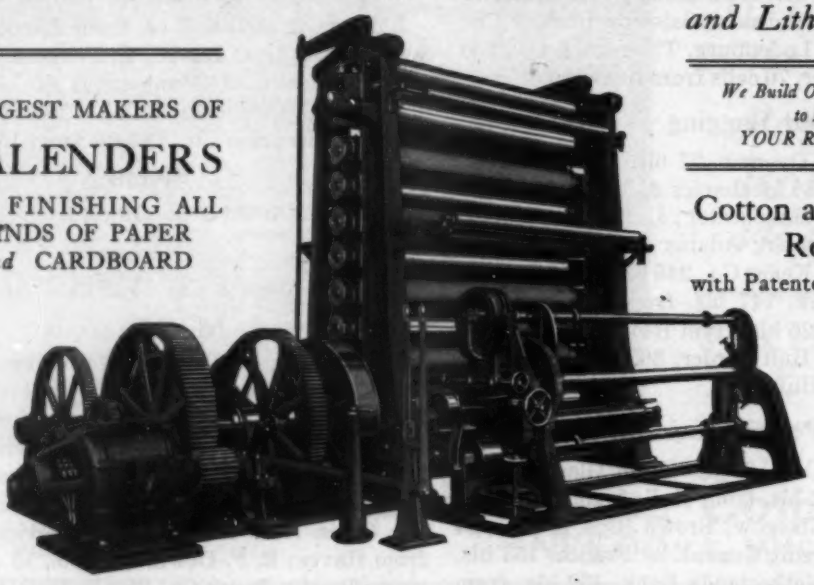
MAKERS OF

Improved Machinery for Wood Pulp, Paper Mills, Paper Converters, Printers and Lithographers.

LARGEST MAKERS OF

CALENDERS

FOR FINISHING ALL KINDS OF PAPER *and* CARDBOARD



We Build Our Machinery to Meet YOUR Requirements

Cotton and Paper Rolls

with Patented Fastenings

Nash Hytor Vacuum Pumps
Nash Hytor Air Compressors

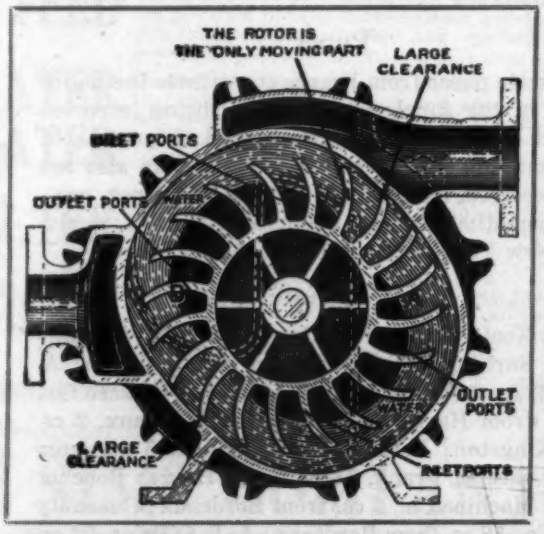
Jennings Hytor Dryer Exhaust Units

These machines insure high efficiency, great durability, minimum maintenance, minimum power.

For full particulars address

THOMAS H. SAVERY, Jr.

1718 Republic Building, CHICAGO, ILL.



Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

KNIVES
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
Simonds Manufacturing Co., Fitchburg, Mass.

LAYBOYS
Moore and White Co., Philadelphia, Pa.

LIFTS
Economy Engineering Co., Chicago, Ill.
Lakewood Eng. Co., The, Cleveland, O.

LINE SHAFT BEARINGS
The Hill Clutch Co., Cleveland, Ohio.

MACHINE DRYER TEMP. CONTROL
Open Coil Heater and Purifier Co., Indianapolis, Ind.
Valley Iron Works, Appleton, Wis.

MECHANICAL PULP
J. Andersen & Co., 21 E. 40th St., New York City.
Hart Trading Co., Inc., Tribune Bldg., New York City.
E. B. Thomas & Co., Inc., 100 Hudson St., New York City.

PAPER BOARDS
The C. L. La Boiteaux Co., 200 Fifth Ave., N. Y.
F. D. Wilson, 1520 Lumber Exchange Building, Chicago, Ill.

MECHANICAL STOKERS
Sanford Riley Stoker Co., Worcester, Mass.

PAPER DISTRIBUTORS
Bermingham and Prosser, Chicago, Ill.
Seaman Paper Co., Chicago, Ill.

PAPER EXPORTERS AND IMPORTERS
American Transmarine Co., 13 Park Row, New York City.
Gatti-McQuade Co., 200 Fifth Ave., New York City.
Hart Trading Co., Inc., Tribune Bldg., New York City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Main Paper Stock Co., 23-31 Peck Slip, New York City.
New York Overseas Co., 17 Battery Place, New York City.
Storm & Bull, 2 Rector St., New York City.
E. B. Thomas & Co., Inc., 100 Hudson St., New York City.
Interstate Pulp and Paper Co., Grand Central Bldg., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.
Parsons Trading Co., 17 Battery Place, N. Y. C.

PAPER MACHINES
Beloit Iron Works, Beloit, Wis.
The Black-Clawson Co., Hamilton, Ohio.

PAPER MANUFACTURERS
Bardeen Paper Co., Otsego, Mich.
Bogalusa Paper Co., Inc., Bogalusa, La.
Bryant Paper Co., Kalamazoo, Mich.
Howard Paper Co., Urbana, O.
Lakeside Paper Co., Neenah, Wis.
Monarch Paper Co., Kalamazoo, Mich.
Munising Paper Co., Munising, Mich.
Northern Paper Mills, Green Bay, Wis.
Oxford Paper Co., 200 Fifth Ave., N. Y. City.
Rex Paper Co., Kalamazoo, Mich.
Ticonderoga Pulp & Paper Co., 200 Fifth Ave., New York City.
Watervliet Paper Co., Watervliet, Mich.
Wausau Sulphate Fibre Co., Mosinee, Wis.
Wolverine Paper Co., Otsego, Mich.

PAPER MANUFACTURERS' SUPPLIES
J. Andersen & Co., 21 East 40th St., New York City.
Robert Blank, 140 Nassau St., New York City.
Francis Hughes Co., 21st St. and Loomis Ave., Chicago.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
Gatti-McQuade Co., 200 Rifth Ave., New York City.
Martin Spinelli, 132 Nassau St., New York City.
Main Paper Stock Co., 25-31 Peck Slip, New York City.
Mendelson Bros. Paper Stock Co., 910 Michigan Ave., Chicago.
New York Overseas Co., Inc., 17 Battery Place, New York City.
Salomon Bros. & Co., 200 Fifth Ave., N. Y. C.
E. B. Thomas & Co., Inc., 100 Hudson St., New York City.

PAPER STOCK CUTTERS
Taylor, Stiles & Co., Riegelsville, N. J.

PAPER TESTERS
B. F. Perkins and Son, Inc., Holyoke, Mass.
The Widney Co., Chicago, Ill.

PARCHMENT MANUFACTURERS
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Sutherland Paper Co., Kalamazoo, Mich.

POWER TRANSMISSION
F. L. Smidth & Co., 50 Church St., N. Y. C.
The Hill Clutch Co., Cleveland, Ohio.

PRINTERS' ROLLERS
American Printers' Roller Co., 316 West Grand Ave., Chicago, Ill.

PULP (Chemical)
American Transmarine Co., 13 Park Row, New York City.
J. Andersen & Co., 21 East 40th St., New York City.
Eastern Manufacturing Co., 501 Fifth Ave., New York City.
Hart Trading Co., Inc., Tribune Bldg., New York City.
Daniel M. Hicks, 140 Nassau St., New York City.
E. J. Keller Company, 200 Fifth Ave., N. Y. C.
New York Overseas Co., Inc., 17 Battery Place, New York City.
Price & Pierce, Ltd., 30 East 42nd St., New York City.
The Pulp & Paper Trading Co., 21 East 40th St., New York City.
Scandinavian-American Trading Co., 50 East 42d St., New York City.
Lagerloef Trading Co., 18 E. 41st St., N. Y. C.

PULP EXTRACTORS
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.

PULP AND PAPER MACHINERY
Beloit Iron Works, Beloit, Wis.
Moore & White Co., Philadelphia, Pa.
Valley Iron Works, Appleton, Wis.
The Black-Clawson Co., Hamilton, Ohio.

PULP WASHERS
The Green Bay Foundry and Machine Co., Green Bay, Wis.

PUMPS (Paper)
Buffalo Steam Pump Co., Buffalo, N. Y.
Dean Bros., Indianapolis, Ind.

PUMPS (Vacuum)
American Steam Pump Co., Battle Creek, Mich.
Buffalo Foundry and Machine Co., Buffalo, N. Y.
Thos. H. Savery, Republic Bldg., Chicago, Ill.
Dean Bros., Indianapolis, Ind.

RAG AND PAPER DUSTERS
Holyoke Machine Co., Holyoke, Mass.

ROTARY VACUUM PUMPS
Sandusky Foundry & Machine Co., Sandusky, O.

RUBBER ROLLS
United States Rubber Co., New York and Chicago

ROLL GRINDING
Bevis & Shartle Mch. Co., Middletown, O.

ROLL WRAPPING MACHINES:
Nekoosa Motor & Machine Co., Nekoosa, Wis.

ROTARY SCREEN
Thos. H. Savery, Republic Bldg., Chicago, Ill.

SAVE-ALLS
The Green Bay Foundry and Machine Co., Green Bay, Wis.

SAWS
Simonds Manufacturing Co., Fitchburg, Mass.

SCREEN PLATES
Central Mfg. Co., Kalamazoo, Mich.
Union Screen Plate Co., Fitchburg, Mass.
William A. Hardy & Sons, Fitchburg, Mass.

SCREEN DIAPHRAGMS
United States Rubber Co., Chicago, Ill.

SHOWER PIPES
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SLITTING AND REWINDING MACHINERY
Cameron Machine Co., Brooklyn, N. Y.

SPEED CHANGES
Moore and White Co., Philadelphia, Pa.

STEAM JET CONVEYORS
American Steam Conveyor Corp., Chicago, Ill.

STOCK CIRCULATING SYSTEM
Claflin Engineering Co., Lancaster, Ohio.
Ticonderoga Machine Works, Ticonderoga, N.Y.

STOCK PUMPS
Buffalo Steam Pump Co., Buffalo, N. Y.

STOCK SHREDDER
The Green Bay Foundry and Machine Co., Green Bay, Wis.

SUCTION ROLLS
Sandusky Foundry and Machine Co., Sandusky, Ohio.

SULPHUR
Union Sulphur Co., 17 Battery Place, New York City.

SULPHUR BURNERS
Valley Iron Works Co., Appleton, Wis.

TIERING MACHINES
Economy Engineering Co., Chicago, Ill.
Lakewood Mfg. Co., Cleveland, Ohio.

TURBINES (Water)
James Leffel and Co., Springfield, Ohio.

VACUUM SYSTEMS
Open Coil Heater and Purifier Co., Indianapolis, Ind.

VALVES
The Crane Co., Chicago, Ill.

VARIABLE SPEED ENGINES
The Brownell Co., Dayton, Ohio.
Chandler and Taylor, Indianapolis, Ind.
Erie Engine Works, Erie, Pa.
Hooven, Owens, Rentschler Co., Hamilton, O.

VENTILATING SYSTEMS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.
Buffalo Steam Pump Co., Buffalo, N. Y.
B. F. Perkins and Son, Inc., Holyoke, Mass.

WASHER WIRES
The W. S. Tyler Co., Cleveland, Ohio.

WASTE PAPER STOCK
Gatti-McQuade Co., 200 Fifth Ave., New York City.
Francis Hughes Co., 21st and Loomis Street, Chicago.
Main Paper Stock Co., 23-31 Peck Slip, New York City.
F. G. Marquardt, Inc., 345 Broadway, N. Y. C.
Martin Spinelli, 132 Nassau St., New York City.
Mendelson Bros. Paper Stock Co., 910 S. Michigan Blvd., Chicago, Ill.
E. B. Thomas & Co., Inc., 100 Hudson St., New York City.
Salomon Bros. & Co., 200 Fifth Ave., N. Y. C.

WATER FILTER
The Green Bay Foundry and Machine Co., Green Bay, Wis.

WATER HEATERS:
The Sims Co., Erie, Pa.

WATER-SOFTENING AND PURIFYING SYSTEMS
Wm. Graver Tank Works, East Chicago, Ind.
Wm. B. Scaife and Sons Co., Oakmont, Pa.

WATER WHEELS
James Leffel and Co., Springfield, Ohio.
Holyoke Machine Co., Holyoke, Mass.

WET MACHINES
Valley Iron Works Co., Appleton, Wis.

WIRE SIGNS
Cheney Bigelow Wire Works, Springfield, Mass.

WRAPPING MACHINES
Nekoosa Motor and Machine Co., Nekoosa, Wis.

FOURDRINIER WIRES

Dandy Rolls . *Cylinder Molds*

Brass, Copper and Iron Cloth

Bank and Office Railings

WIRE SIGNS

Cheney Bigelow Wire Works

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Bed Plates

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Rag Knives

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Paper Shear Blades

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Barker Knives

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Chipper Knives

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Paper Cutting Knives

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Circular Cutters

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Beloit, Wisconsin

Agents for Canada:

PULP & PAPER MILL ACCESSORIES, LTD.,

SHAUGHNESSY BLDG., MONTREAL, CANADA

Buyers' Guide—What and Where to Buy

Equipment, Apparatus, Supplies and Raw Materials Used by the Paper Industry

ADHESIVES
The A. P. R. Mfg. Co., 316 West Grand Ave., Chicago.
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

ACID RESISTING BRONZE
Sandusky Foundry & Machine Co., Sandusky, Ohio.
William A. Hardy & Sons, Fitchburg, Mass.

AGITATOR EQUIPMENT
The Hill Clutch Co., Cleveland, Ohio.
Moore & White Co., Philadelphia, Pa.

AIR CONDITIONING AND CONTROL APPARATUS
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.

ANGLE VALES
The Crane Company, Chicago, Ill.

ARCHITECTS
James L. Carey, 208 N. Laramie St., Chicago.

ASSORTING TABLES
Moore and White Co., Philadelphia, Pa.

ASH CONVEYOR SYSTEMS
American Steam Conveyor Corp., Chicago, Ill.

BARKERS
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works Co., Appleton, Wis.

BARKING DRUMS
H. O. Numan, Green Bay, Wis.

BEATER BARS
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
L. & I. J. White Co., Buffalo, N. Y.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER BED PLATES
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
L. & I. J. White Co., Buffalo, N. Y.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATER ROLL FILLING
John W. Bolton & Sons, Inc., Lawrence, Mass.
R. J. Dowd Knife Works, Beloit, Wis.
L. & I. J. White Co., Buffalo, N. Y.
Simonds Manufacturing Co., Fitchburg, Mass.

BEATING, WASHING AND BLEACHING ENGINES
Beloit Iron Works, Beloit, Wis.
The Black-Clawson Co., Hamilton, Ohio.
Dilts Machine Co., Inc., Fulton, N. Y.
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works Co., Appleton, Wis.

BEATERS (Continuous)
Claflin Engineering Co., Lancaster, Ohio.
The Griley-Unkle Eng. Co., Ft. Wayne, Ind.

BELTING (Rubber)
United States Rubber Co., New York and Chicago

BELT DRIVES
The Hill Clutch Co., Cleveland, Ohio.

BLEACHING (Propellers)
Moore and White Co., Philadelphia, Pa.

BLANKETS
Frank F. Alt, 421 Columbia St., La Fayette, Ind.

BLOWERS
Buffalo Steam Pump Co., Buffalo, N. Y.

BOARD MACHINES
Beloit Iron Works, Beloit, Wis.

BOARDS (Straw)
The C. L. La Boiteaux Co., Cincinnati, O.

BOILER FEEDER
The Farnsworth Co., Conshohocken, Pa.

BRASS WIRE CLOTH
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.

BRIMSTONE
Union Sulphur Co., 17 Battery Place, New York City.

BRONZE JACKETS
Sandusky Foundry & Machine Co., Sandusky, Ohio.

BUNDLING SYSTEMS
Signode System, Lake St., Chicago

CALENDERS
Beloit Iron Works, Beloit, Wis.
Holyoke Machine Co., Holyoke, Mass.
The Black-Clawson Co., Hamilton, Ohio.
Dilts Machine Co., Inc., Fulton, N. Y.

CALENDER DOCTORS
Ticonderoga Machine Works, Ticonderoga, N.Y.

CALENDER ROLLS
Holyoke Machine Co., Holyoke, Mass.
B. F. Perkins and Son, Inc., Holyoke, Mass.

CENTRIFUGAL PUMPS
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Valley Iron Works Co., Appleton, Wis.

CHIPPERS
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works Co., Appleton, Wis.

CHIPPER AND BARKER KNIVES
John W. Bolton & Sons, Inc., Lawrence, Mass.
L. & I. J. White Co., 85 Columbia St., Buffalo, N. Y.
Simonds Manufacturing Co., Fitchburg, Mass.
R. J. Dowd Knife Works, Beloit, Wis.

CLAYS AND FILLERS
Binney & Smith Co., 81 Fulton St., N. Y. C.
Daniel M. Hicks, 140 Nassau St., New York City.
The John W. Higman Co., Inc., 29 Broadway, New York City.
Miner-Edgar Co., 30 Church St., New York City.
International Pulp Co., 41 Park Row, N. Y. C.

COAL BUNKERS
The Brownhoist Co., Cleveland, Ohio.

COATED PAPERS
Bardeen Paper Co., Otsego, Mich.
Bermingham & Prosser, Chicago, Ill.
Bryant Paper Co., Kalamazoo, Mich.
Monarch Paper Co., Kalamazoo, Mich.
Rex Paper Co., Kalamazoo, Mich.
Seaman Paper Co., Chicago, Ill.
Watervliet Paper Co., Watervliet, Mich.

CRANES
The Brownhoist Co., Cleveland, Ohio.
John F. Byers Co., Ravenna, Ohio.
Northern Engineering Works, Detroit, Mich.
The Chisholm-Moore Mfg. Co., Cleveland, O.

CYLINDER MOLDS
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
W. S. Tyler Co., Cleveland, Ohio.

DANDY ROLLS
Appleton Wire Works, Appleton, Wis.
Central Mfg. Co., Kalamazoo, Mich.
Cheney Bigelow Wire Works, Springfield, Ohio.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.

DECKEL FRAME SUPPORTS
Huband and Nash, Menasha, Wis.

DRUM WINDERS
Ticonderoga Machine Co., Ticonderoga, N. Y.

DRYER FELTS
Appleton Woolen Co., Appleton, Wis.
F. C. Huyck & Sons.
Shuler and Benninghofen, Hamilton, Ohio.

DYESTUFFS
Binney & Smith, 81-83 Fulton St., N. Y. City.
E. I. Du Pont de Nemours & Co., Wilmington, Del.

ELEVATORS (Portable)
Economy Engineering Co., Chicago, Ill.
Lakewood Mfg. Co., The, Cleveland, Ohio.

ELECTRIC FANS
B. F. Perkins and Sons, Inc., Holyoke, Mass.

ELECTRIC HOISTS
John F. Byers Machine Co., Ravenna, Ohio.
Northern Engineering Co., Detroit, Mich.

ELEVATING TRUCKS
Economy Engineering Co., Chicago, Ill.
Moore and White, Philadelphia, Pa.

ENGINES
Chandler and Taylor, Indianapolis, Ind.
Erie Engine Works, Erie, Pa.
Hooven, Owens, Rentschler Co., Hamilton, Ohio.

ENGINEERS
James L. Carey, 208 North Laramie St., Chicago, Ill.

EVAPORATORS:
Buffalo Foundry & Machine Co., Buffalo, N. Y.

FASTENERS (Screen Plate)
Union Screen Plate Co., Fitchburg, Mass.

FELTS AND JACKETS
Appleton Woolen Co., Appleton, Wis.
F. C. Huyck & Sons, Albany, N. Y.
Shuler and Benninghofen, Hamilton, Ohio.

FELT AND WIRE GUIDES
Huband and Nash, Menasha, Wis.
Moore & White Co., Philadelphia, Pa.

FOURDRINIER WIRES
Appleton Wire Works, Appleton, Wis.
Cheney Bigelow Wire Works, Springfield, Mass.
Lindsay Wire Weaving Co., Cleveland, Ohio.
W. S. Tyler Co., Cleveland, Ohio.
Wisconsin Wire Works, Appleton, Wis.

FIBRE MAKING PROCESSES
Hall, Ward & Walker, Inc., Sherman Bldg., Watertown, N. Y.

FILTER (Continuous Suction)
Green Bay Foundry & Machine Co., Green Bay, Wis.

FRICTION CLUTCHES
The Hill Clutch Co., Cleveland, Ohio.
Moore and White Co., Philadelphia, Pa.

GEARS
The Hill Clutch Co., Cleveland, Ohio.

GLUES
American Printers Roller Co., Chicago, Ill.
E. F. Russ Co., 201 Devonshire St., Boston, Mass.

GRINDERS
Holyoke Machine Co., Holyoke, Mass.
Valley Iron Works, Appleton, Wis.

HAND STOKERS
The Files Eng. Co., Inc., Providence, R. I.

HEATERS (Feed Water)
The Sims Co., Erie, Pa.

HOISTING AND CONVEYING SYSTEMS
John F. Byers Machine Co., Ravenna, Ohio.
Northern Engineering Co., Detroit, Mich
The Chisholm-Moore Mfg. Co., Cleveland, Ohio.

HOSE
United States Rubber Co., Chicago, Ill.

HYDRAULIC TURBINES
Holyoke Machine Co., Holyoke, Mass.
James Leffel and Co., Springfield, Ohio.

IRON CASTINGS
Beloit Iron Works, Beloit, Wis.
Valley Iron Works Co., Appleton, Wis.

JORDAN FILLINGS
J. W. Bolton & Sons, Inc., Lawrence, Mass.

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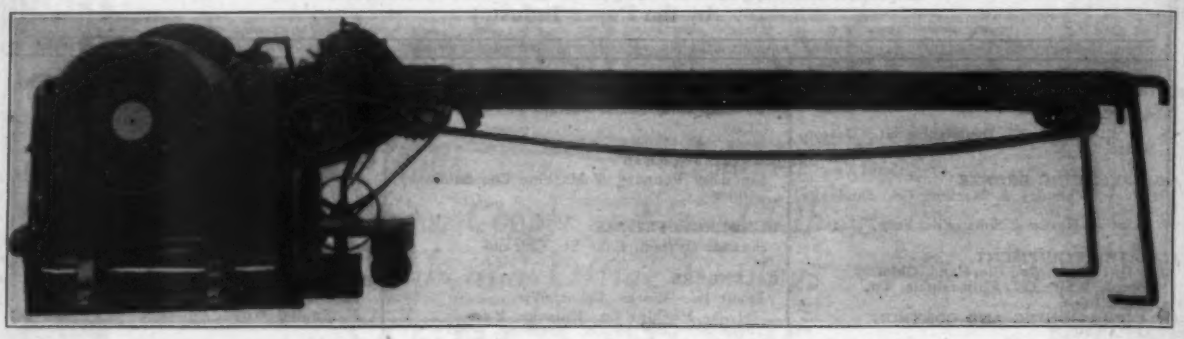

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ALBANY, N. Y.

Alphabetical Index to Our Advertisers

When writing them, please mention The Paper Industry

A

Alt, Frank F., 421 Columbia St., Lafayette, Ind..... 780
American Printers' Roller Mfg. Co., 316 W. Grand Ave., Chicago 760
American Steam Conveyor Corp., Chicago, Ill..... 767
American Steam Pump Co., Battle Creek, Mich..... 769
American Transmarine Co., Inc., 13 Park Row, N. Y. C. 792
Andersen & Co., J., 21 E. 40th St., N. Y. C..... 788
Appleton Wire Works, Appleton, Wis..... 698
Appleton Woolen Mills, Appleton, Wis..... 777

B

Bardeen Paper Co., Otsego, Mich..... 775
Bayley Mfg. Co., 732 Greenbush St., Milwaukee, Wis.... 772
Beloit Iron Works, Beloit, Wis.....Inside Back Cover
Bermingham & Prosser, Kalamazoo, Mich..... 782
Bevis & Shartle Machine Co., Middletown, O..... 764
Binney & Smith Co., 81-83 Fulton St., New York City.. 767
Bird & Son, Inc., East Walpole, Mass..... 791
Bolton, John W., & Son, Lawrence, Mass..... 761
Brown Hoisting Machinery Co., Cleveland, Ohio..... 762
Brownell Co., The, Dayton, O..... 779
Bryant Paper Co., Kalamazoo, Mich..... 704
Buffalo Foundry & Machine Co., Buffalo, N. Y..... 781
Buffalo Steam Pump Co., Buffalo, N. Y..... 700
Buyers Machine Co., John F., Ravenna, O..... 774

C

Carey, James L., 208 N. Laramie St., Chicago, Ill..... 761
Central Manufacturing Co., Kalamazoo, Mich..... 784
Chandler & Taylor, Indianapolis, Ind..... 779
Cheney Bigelow Wire Works, Springfield, Mass..... 798
Chisholm-Moore Mfg. Co., The, Cleveland, O..... 706
Claflin Engineering Co., Lancaster, Ohio..... 771
Crane Company, The, Chicago, Ill..... 706

D

Dean Bros. Steam Pump Co., Indianapolis, Ind..... 705
Detroit Graphite Co., Detroit, Mich..... 701
Dilts Machine Works, Inc., Fulton, N. Y..... 763
Dowd Knife Works, R. J., The, Beloit, Wis..... 798
Du Pont de Nemours & Co., Wilmington, Del..... 697

E

Eastern Manufacturing Co., 501 Fifth Ave., N. Y. C.... 766
Economy Engineering Co., The, Chicago, Ill..... 763
Erie Engine Works, Erie, Pa..... 779

F

Farnsworth Company, The, Conshohocken, Pa..... 709
Files Engineering Co., Inc., The, Providence, R. I..... 759

G

Gatti-McQuade Co., 200 Fifth Ave., New York City.... 776
Graver Tank Works, East Chicago, Ind..... 695
Green Bay Foundry & Machine Works, The, Green Bay, Wisconsin .....Inside Front Cover
Griley-Unkle Engineering Co., Ft. Wayne, Ind..... 757

H

Hardy & Son, Wm. A., Fitchburg, Mass..... 763
Hart Trading Co., Tribune Building, N. Y. C..... 792
Hicks, Daniel M., 140 Nassau St., New York City..... 784
Hill Clutch Co., Cleveland, Ohio..... 766
Higman, The John W., Co., Inc., 29 Broadway, N. Y.... 777
Holyoke Machine Co., Holyoke, Mass..... 796
Hooven, Owens, Rentschler Co., Hamilton, Ohio..... .....Front Cover
Howard Paper Co., The, Urbana, O..... 787
Huband & Nash, Menasha, Wis..... 773
Hughes Co., Francis, 21st and Loomis Sts., Chicago..... 784
Huyck & Sons, F. C., Albany, N. Y..... 800

I

International Pulp Co., 41 Park Row, N. Y. C..... 761
Interstate Pulp and Paper Co., Grand Central Terminal, New York City..... 761

K

Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich. 767
Keller, E. J., 200 Fifth Ave., N. Y. C..... 792

L

La Boiteaux, The C. L., Co., Cincinnati, Ohio..... 786
Lakewood Eng. Co., The, Cleveland, O.....710, 711
Lagerloef Trading Co., Inc., 18 E. 41st St., N. Y. C..... 693
Lakeside Paper Co., Neenah, Wis..... 782
Leffel and Company, James, Springfield, Ohio..... 779
Lindsay Wire Weaving Co., The, Cleveland, Ohio..... 768

M

Main Paper Stock Co., 25-31 Peck Slip, N. Y. C..... 784
Marquardt, Inc., F. G., 345 Broadway, N. Y. C..... 790
Mendelson Bros. Paper Stock Co., 910 Michigan Blvd., Chicago 784
Miner-Edgar Co., 30 Church St., N. Y. C..... 790
Monarch Paper Co., Kalamazoo, Mich..... 702
Moore & White Co., Philadelphia, Pa..... 691
Munising Paper Co., Munising, Mich..... 702

N

Nekoosa Motor & Machine Co., Nekoosa, Wis..... 794
New York Overseas Co., 17 Battery Place, N .Y. C.....790
Northern Engineering Works, Detroit, Mich..... 761
Northern Paper Mills, Green Bay, Wis..... 773
Numan, H. O., Green Bay, Wis..... 775

O

Open Coil Heater and Purifier Co., Indianapolis, Ind..... 793
Oxford Paper Co., 200 Fifth Ave..... 791

P

Parsons Trading Co., 17 Battery Place, N. Y. C..... 792
Perkins & Son, Inc., B. F., Holyoke, Mass..... 775
Pulp & Paper Trading Co., 21 E. 40th St., N. Y. C..... 792
Price & Pierce, 30 E. 42nd St., N. Y. C..... 788

R

Russ Company, E. F., 201 Devonshire St., Boston, Mass. 761

S

Salomon Bros. & Co., 200 Fifth Ave., N. Y. C..... 791
Sanford-Riley Stoker Co., Worcester, Mass..... 770
Sandusky Foundry & Machine Co., Sandusky, Ohio..... 802
Savery, Thos. H., Republic Bldg., Chicago, Ill..... 796
Scaife & Sons Co., Wm. B., Oakmont, Pa..... 767
Scandinavian American Trading Co., 50 E. 42nd St., N. Y. C..... 788
Seaman Paper Co., Chicago, Ill..... 696
Shuler & Benninghofen, Hamilton, Ohio..... 769
Signode System, Chicago, Ill..... 769
Sims Co., The, Erie, Pa..... 794
Simonds Manufacturing Co., Fitchburg, Mass..... 775
Spinelli, Martin, 132 Nassau St., N. Y. C..... 788
Smidth & Co., F. L., 50 Church St., N. Y. C..... 765
Storm & Bull, 2 Rector St., N. Y. C..... 767
Sutherland Paper Co., Kalamazoo, Mich..... 782

T

Taylor Styles & Co., Riegelsville, N. J..... 800
Thomas, E. B., Co., New York City..... 784
Ticonderoga Machine Works, Ticonderoga, N. Y..... 775
Tyler, W. S., & Co., Cleveland, Ohio..... 786

U

Union Screen Plate Co., Fitchburg, Mass..... 786
Union Sulphur Co., 17 Battery Place, N. Y. C..... 777
United States Rubber Co., New York..... 708

V

Valley Iron Works Co., Appleton, Wis.....Back Cover

W

Watervliet Paper Co., Watervliet, Mich..... 694
Wausau Sulphate Fibre Co., Mosinee, Wis..... 778
White Co., L. & I. J., 85 Columbia St., Buffalo, N. Y.... 790
Widney Co., The, Chicago, Ill..... 763
Wilson, F. D., 1520 Lumber Exchange Bldg., Chicago, Ill. 802
Wisconsin Wire Works, Appleton, Wis..... 786
Wolverine Paper Co., Otsego, Mich..... 769

300

DAILY CAPACITY IN TONS

Standard Grades of Paper Boards

MANUFACTURED BY

ALTON BOX BOARD & PAPER COMPANY

CHICAGO COATED BOARD COMPANY

SALES DEPARTMENT
Office: 1520 Lumber Exchange Building
CHICAGO, ILL.

F. D. WILSON, Sales Manager
Address all communications regarding sales to this office

¶ The following mills have recently ordered suction rolls from us. Some of them already have in use as many as twelve:

Brown Company, Berlin, N. H.
Fox River Paper Company, Appleton, Wis.
Oglesby Paper Co., Middletown, Ohio.
Keith Paper Co., Turners Falls, Mass.
B. D. Rising Paper Co., Housatonic, Mass.
Merrimac Paper Co., Lawrence, Mass.
Crown Willamette Paper Co., Portland, Ore.
Titagher Paper Mills, Calcutta, India.
Northern Paper Mills, Green Bay, Wis.
Oxford Paper Co., Rumford, Me.
S. D. Warren & Co., Cumberland Mills, Me.
King Paper Co., Kalamazoo, Mich.
Kalamazoo Paper Co., Kalamazoo, Mich.
Monarch Paper Co., Kalamazoo, Mich.

¶ Present conditions argue more than ever the need of suction rolls.

The Sandusky Foundry & Machine Co.
SANDUSKY, OHIO